SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1395.—Vol. XXXII.] LONDON, SATURDAY, MAY 17, 1862. [WITH JOURNAL] STAMPED.... SIXPENCE. UNSTAMPED. FIVEPENCE.

D MINING, AND THE GOLD DISCOVERIES MADE SINCE 1851.

BY J. ARTHUR PHILLIPS, ESQ.

[Read at the Society of Arts, on Wednesday, May 14.]

ould be obviously impossible to attempt to give within the limits of esent paper a detailed account of all the valuable gold discoveries have been made within the last ten years, and I shall, therefore, arily confine myself to the more important only, but shall, at the ime, briefly notice various modifications which experience has in- ed into the processes for treating auriferous ores, and succinctly to some of the causes which have unfavourably influenced this class ustry. Gold is usually found in a quartzose gangue, traversing al- alæozoic shales, and these deposits are frequently richest in the of eruptive rocks. The oldest stratified rocks have been seldom auriferous, but the sedimentary deposits which follow in the series generally ascribed to the Silurian, Devonian, and Carboniferous have, particularly when highly metamorphosed, yielded the larg- unts. Of these those usually described as Silurian rocks have far the most productive, but instances are not wanting, even in of small quantities of the precious metal having been found in the nerates of the Carboniferous period.

almost always, if not always, occurs in the native or metallic state; ly in the form of small flakes or granules, but occasionally in of considerable weight. It is never pure, being invariably alloyed lver, and frequently contains small proportions of iron and copper. also often associated with various metallic sulphides, such as cop- ites, galena, blende, and particularly with iron pyrites and mis- It appears somewhat doubtful whether, in every instance, all the metallic sulphides exists in the form of minute metallic particles, some cases at least, it may not be present in combination with I may, however, observe that from the results of numerous ex- ts on this subject, I am inclined to the belief that gold does some- cur in small quantities in the form of sulphides, but that oxide of the extraction and utilisation of which sundry much-vaunted s have been devised, does not exist in any of the known aurifer- The extraction of gold from the sulphides would, by the ordi- ess of amalgamation, present considerable difficulty, and, conse- it will often be found advantageous to separate and collect the &c., contained in the tailings, and subsequently to subject them lurgic treatment by fusion either with galena, litharge, or some d product.

most important gold discoveries made during the last ten years are British Columbia, New Zealand, and Nova Scotia; but it may bserved that gold in paying quantities has been recently disco- the neighbourhood of Dolgelly, in North Wales.

SH COLUMBIA.—As early as June, 1856, Mr. Douglas, the Go- f Vancouver's Island, reported to the Secretary of State the dis- f gold in the British territory, north of the 49° of latitude, and at the earnings of the diggers ranged from 2*l.* to 8*l.* a day. In nce, however, of the hostile attitude assumed by the natives, the f diggers was very limited. Altogether this discovery attracted ss attention than might have been anticipated, but in December, overnor Douglas reported that the Indians themselves were exten- gaged in the search for gold, and that the accounts which had e neighbouring states of America had caused considerable excitement. It owever, until May, 1858, that a stream of immigration sufficient to overpower tion of the aboriginees had fairly set in, and the British public learnt, for the that the mainland of New Caledonia, as the district extending from the Red ds Pacific was somewhat vaguely designated, was a rich and beautiful land, e every promise of becoming a flourishing and highly important colony.

ner correspondent, writing from Victoria, Vancouver's Island, under date of the present year, says:—"Beginning with Fraser River, the main artery of ons region, I may state that gold is known to exist, and has been worked at ny places in the river and on its banks, from a point about 45 miles from its to near its source in the Rocky Mountains; in other words, from the 49th up parallel of north latitude, a distance (taking in the windings) of some 800 e south branch of the Fraser has its source near Mount Brown, in the Rocky , in about 53° north latitude, 118° 40′ west longitude. Thence this branch 0 miles to Fort George, a post of the Hudson's Bay Company. The north es in an opposite direction. It receives its supply from a series of lakes lying ° and 55° of north latitude; longitude about 124° 50′ west, and runs a course es to its junction with the south branch, some miles below the 54th parallel titude. Here the union of the two branches form the Fraser River proper. north branch, which is also a gold-bearing stream, and which was worked to the other arm, the two will give us a continuous stretch of auriferous ritory upwards of 1000 miles in length, extending for many miles back into , but not including the tributary rivers which fall into the Fraser. In short, self is now known to be auriferous, and to pass through a gold-bearing ughout its whole course. Gold is also found in most of the tributaries of of which no less than 59 are known. The great length of the main river, mber of its tributaries, will give some idea of the auriferous resources of the hat these facts do not by any means convey a comprehensive or accurate vast extent of the area of the gold field, because they are limited to the cen- of the country, while the whole of the upper portion of British Columbia, thern to its northern boundary, is auriferous. Besides the gold found in d on the shores of these streams, the Fraser itself and many of its tributaries and bordered by terraces, all of which yield gold also. These terraces, or the miners call them, run at intervals along both sides of the rivers for gth, and they recede where the mountains retire for distances back into the ying from a few acres to a few miles in breadth. They are objects of curi- peculiation, and add much to the beauty of the rude scenes in which they the regularity and evenness of their structure. They generally occur on of the river (opposite to each other) at the same place, sometimes at the on both sides, sometimes at different elevations, high on this and low on ide of the river, and in some places they are multiplied into several succes- parallel plateaux, rising one above the other as they recede from the bank. es are composed of the ordinary alluvial deposits, loam, gravel, stones, sand, , and they are thick masses, rising generally to a height of 150 to 200 ft." statement of the same writer, there would also appear to be abundance of r localities besides the vicinity of the Fraser. Large yields have been n the diggings between Fort Hope and Fort George, about 100 miles from its ese mines are said to have yielded during the last season an average of $17 , and a party of three men took from three days' digging $240. At Okana- e distant, the average produce is stated to have been $4 to the hand. The ver and its tributaries had also proved highly auriferous. North River to $10 to the hand, and on the Barrière a community of French Canadians h as $50 per diem. Cariboo, however, appears to be the largest and the gold districts hitherto discovered. In confirmation of this, it may be steele's claim, Williams's Creek (Cariboo), a company of five partners their operations during the summer months. They began their preparations mber for their sluices, and at first their claim did not promise so much as During the first three days they obtained little or nothing, but on the her labours were rewarded by the collection of 4 ozs. of gold. On the fifth e 10 ozs., and on the sixth 41 ozs. From that time the yield went on in- il it reached 367 ozs. per day, whilst the last day's work gave them a return The five partners employed four hands to assist them in clearing away the he labourers were paid $8 per day each, in addition to their board, and the total value of the gold raised during not more than two months' actual work was equal to a money value of 21,875*l.* The total area of the claim so worked was 80 feet by 25 feet, thus showing the extreme richness of some of the deposits of British Columbia. I cannot, however, refrain from remarking on one of the inferences that might be drawn from the statement of the *Times* correspondent. He would appear to imply that the gold fields of British Colombia afford all prizes and no blanks. This is, I confess, a somewhat different conclusion from that at which I should myself arrive, after considerable experience in some of the most important gold districts. We generally hear a great deal about the prizes, but little or nothing is said of the blanks; and I certainly entertain considerable doubt as to whether the glowing accounts which from time to time reach this country through the medium of the newspapers are at all times to be relied on. Of one fact, however, I am certain, and that is that I was some years since acquainted with the correspondent of one of our leading journals, who, having taken up his residence in the part of the country in which I was then living, made a large fortune by land speculations, which were in no small degree fostered by means of the articles appearing in that paper. I would not, of course, impute anything like wilful misrepresentation to the resident correspondent, but it is evidently difficult to take a dispassionate view of facts and circumstances around us when our material interests are deeply involved in favour of a foregone conclusion. There can, however, no longer be any doubt but that gold fields of extraordinary richness, and so far as the alluvial washings are concerned easily worked, exist in almost all parts of the colony, and also that water is plentiful; and I merely throw out these remarks for the benefit of those who, from reading the letters in the *Times*, may be induced to believe that a large fortune is to be made out of mere existence in British Columbia. Let those who go out be determined to get their own living by the exercise of industry and the strength of their own arms, and they may rest assured that an honourable independence may be realised in the colonies with much greater facility and certainty than in any European country.

NEW ZEALAND.—Early in the present year accounts reached this country of gold discoveries having been made in New Zealand, and although, so far as I am aware, no very detailed reports of the method of its occurrence have yet been received, there is every reason to believe that remunerative deposits of the precious metal have been found in this colony. A letter published in the *Daily Telegraph* in March last, states:—

"The great influx of gold into Dunedin from the Otago gold fields still continues. On Nov. 22 and 28, and on Dec. 15 last, the escorts conveyed respectively 21,000, 15,000, and 14,000 ozs. The total amount of gold brought down by escort up to Dec. 20, is 191,831 ozs., which, at 3*l.* 17s. per oz., is of the value of about 738,550*l.* This is independent of what has arrived here through private hands. New diggings are continually being discovered in the locality." It also goes on to say that, "It will not be long before New Zealand will be recognised as a gold-bearing country, for it is known that the whole of its mountain ranges are auriferous, from the south to the extreme point of the north." The *Otago Daily Times*, of Feb. 17, has the following remarks on the rapid progress of that settlement, consequent upon the discovery of gold fields in the immediate vicinity:—"The population of Otago is on the increase, and the gold fields continue to prove very productive to the number of miners engaged in working them. Every day tends to prove that gold exists in paying quantities over a large portion of the province, and that gold mining will continue to form a profitable pursuit to a large population for many years to come. The most noticeable event during the last month has been the discovery of a new gold field on the Lammerlaw Creek, near its junction with the Waipori. Opinions respecting it are more or less conflicting, but the general belief is that it will prove a valuable addition to the already opened gold fields."

I am not in possession, however, of any special information relative to this colony, and shall, consequently, pass on to notice the gold fields of Nova Scotia, which I have recently visited, and with which I am, therefore, better acquainted.

NOVA SCOTIA.—The whole of the Atlantic shore of the province of Nova Scotia is bordered, in an unbroken line, by strata of a metamorphic character, and probably of great geological antiquity, frequently broken through by eruptive rocks. These form a coast in some places low and rugged, and in others boldly undulating; their soil is generally rocky and sterile, although there are large tracts well covered with timber, and affording prosperous agricultural settlements. Along the Atlantic shore this district is generally low, gradually rising to a height of some 300 ft. as it advances northward. Its coast line has, according to Dr. Dawson, a general direction of south 68° west, whilst its inland boundary, although presenting some considerable undulations, has a direction of south 80° west. The extreme breadth of this band at Cape Canseau, its northern extremity, is about eight miles, whilst in its extension westward it gradually increases until, at the west branch of the St. Mary's River, 80 miles west of Cape Canseau, it is known to be 30 miles wide. In the western counties its width has not yet been accurately ascertained, but here its entire breadth cannot be far short of 50 miles. Its total length corresponds with that of the peninsula of Nova Scotia.

This band, in which almost the whole of the gold discovered has been found, chiefly consists of thick bands of slate and quartzite highly inclined, and having a general north-east and south-west strike. In different localities these rocks, which probably belong to the Silurian epoch, have been penetrated by masses of granite, and in their vicinity the quartzites and clay-slates usually present a highly metamorphosed appearance.

Since the gold discoveries in California and Australia have been generally known, and public attention has been directed to the conditions under which deposits of the precious metal usually occur, reports of similar discoveries have from time to time locally arisen in different parts of Nova Scotia. In every instance, however, either mica or iron pyrites would appear to have been mistaken for gold. Some years since, also, a considerable amount of excitement was caused by an article in *Blackwood's Magazine*, in which it was affirmed that gold would be found in the hills to the south of Annapolis, and comparisons were instituted between that locality and the valley of the Sacramento. Many persons were induced by this article to leave their ordinary occupations to seek for gold, but their researches having in all cases proved unsuccessful, the fever gradually subsided, and the subject was ultimately forgotten. It is also worthy of remark that Dr. Dawson, so long ago as 1855, when describing the great metamorphic band, observes:—"Quartz veins occur abundantly in many parts of this district, and it would not be wonderful if some of them should be found to be auriferous." There is, nevertheless, no authentic evidence of the discovery of the precious metal in the province previous to 1860, when some hundreds of persons, tempted by rumours of gold having been found, commenced exploring near the head waters of the Tangier River. The amount of gold obtained in this locality was, however, so small that the miners ultimately become discouraged, and the excitement gradually subsided. In the month of March, last year, a man who was stooping to drink at a brook observed a piece of gold among the pebbles at the bottom, and having picked it up, searched and found more. This took place about a mile to the east of the Tangier River. From this date attention became directed to the locality, numerous claims were taken up, and considerable quantities of gold were obtained by breaking the quartz with hammers, and washing the resulting dust in tin pans. In June the discovery of gold was reported at Lunenberg, at a locality called the "Ovens." The veins at this place, although generally small, are frequently highly auriferous, and appear to cross each other in almost all directions, in a metamorphic shale belonging to the great southern band. On these discoveries being made known, numerous claims were immediately taken up, and various companies formed for working the veins presenting themselves numerously in the cliff.

Shortly after the discovery of the auriferous nature of the quartz veins, it was found that the sands on the beach beneath the headland also contained large quantities of gold. Here claims were likewise rapidly staked off and worked by means of cradles, so that the aggregate daily yield from the several shore operations soon reached 100 ozs. Gold discoveries subsequently followed each other in rapid succession at Lawrence Town, Dartmouth, and Sheet, and Isaac's Harbours, Sherbrooke, and Laidlaw's Farm. The most remarkable deposit of auriferous quartz hitherto found in Nova Scotia is undoubtedly that at Laidlaw's Farm. The principal workings are here situated near the summit of a hill composed of hard metamorphic shales, where openings have been made to the depth of some 4 or 5 ft. upon a nearly horizontal bed of corrugated quartz of from 8 to 10 ins. in thickness. This auriferous deposit is entirely different from anything I had before seen, and when laid open presents the appearance of trees or logs of wood laid together side by side, after the manner of an American corduroy road. From this circumstance, the miners have applied the name of "barrel quartz" to the formation, which, in many cases, presents an appearance not unlike a series of small casks laid together side by side and end to end. The diagram on the wall will serve to explain the mode of occurrence of this deposit. The rock covering this remarkable horizontal vein is exceedingly hard, but beneath it for some little distance it is softer and somewhat more fissile. The quartz is itself foliated parallel to the lines of curvature, and exhibits a tendency to break in accordance with these strize. The headings, and particularly the upper surfaces of the corrugations, are generally covered by a thin bark-like coating of brown oxide of iron, which is seen frequently to enclose numerous particles of coarse gold, and the quartz in the vicinity of this oxide of iron is itself often highly auriferous. The other gold veins of the province present, generally speaking, few distinctive peculiarities, and very closely resemble those found in California and Australia. Their general course is north 60° west, and their dip towards the south, but there are not unfrequent exceptions to this rule. In addition to gold, the most auriferous veins of Nova Scotia contain variable quantities of iron-pyrites, mispickel, galena, blende, and less frequently a small proportion of argentiferous and auriferous sulphide of copper. Here, as elsewhere, the presence of the sulphides is regarded as a favourable indication of the richness of a vein, and leads containing much disseminated galena almost invariably yield a remunerative quantity of gold.

The productive veins hitherto discovered have, as before stated, been found in the older rocks on the Atlantic shore, and commonly occur in parallel groups, near the centre of which, and parallel to the productive veins, a large reef of crystallised and comparatively unproductive quartz is, in many instances, found to run. These large courses are locally called "bull veins," and usually contain small quantities only of the precious metal. The attention of the Nova Scotian gold miners has, contrary to the usual practice, been almost entirely directed to the explorations of the veins of gold quartz, and alluvial digging has consequently been all but entirely neglected. There is, however, every reason to believe that a careful examination of the alluvial deposits would lead to the discovery of large quantities of gold.

It would be impossible to form any reliable estimate of the total amount of gold which has hitherto resulted from mining operations in Nova Scotia, as the claims are for the most part worked by private individuals, who are generally indisposed to furnish information either as to their success or failure, and no official returns on the subject have as yet appeared. It is manifest, however, from the characteristics of the localities in which the precious metal has already been discovered, and the great extent of the gold-bearing portions of the province, that there is every reason to anticipate that further and more important results will be developed by the workings and explorations of the present summer, and that ere long Nova Scotia will take an important position among gold-producing countries. The thickness of its auriferous veins is, perhaps, less than those of California and some other countries, but they are, generally speaking, richer in visible gold than the average of those I have seen in any other part of the world. It must also be taken into consideration that Nova Scotia possesses many decided advantages over both California and Australia. Each of these countries is situated at a great distance from Europe, and can only be reached after a long and expensive passage, and, as a natural consequence, wages were for a long time exceedingly high and provisions proportionately dear. Nova Scotia, on the contrary, is within an easy distance both from Europe and the United States of America, and possesses a considerable settled population of intelligent, industrious, and sober people, eminently adapted, after a little experience, to become steady and efficient miners. The whole of the gold-bearing portion of the province also lies within a convenient distance from the coast, which abounds with magnificent harbours, affording ample security to shipping, whilst wood in large quantities is to be everywhere procured for all descriptions of mining uses, and an abundant supply of water is generally to be met with for the purpose of washing and amalgamation. From these circumstances, it is impossible that wages can ever reach the extravagant rates that mainly led to the failure of nearly all the gold mining enterprises of 1852, since which period many of the mines have been advantageously worked which were then abandoned on account of the enormous expenditure necessary to carry on the operations.

GOLD OF NORTH WALES.—The gold district of North Wales would appear to be chiefly confined to an area of about 20 square miles, lying on the north of the turnpike-road leading from Dolgelly to Barmouth. In this region the Cambrian rocks are overlaid by the Silurian, and the general geological features of the country strongly resemble those of other auriferous localities. The most important discoveries have been made in the Dol-y-frwgnog, Prince of Wales, and the Clogau Mines, of which the latter only is at the present time worked with remunerative results. So long ago as 1844 a paper was read before the British Association by Mr. Arthur Dean, who stated that a complete system of auriferous veins exists throughout the whole of the Snowdon'an or Lower Silurian formation of North Wales. In consequence of this statement, operations were commenced at Cwmhesian, but, the results obtained not having been found satisfactory, they were finally abandoned. Ten years subsequent to this time the mine was again worked for gold, but still with unfavourable results. Machinery for crushing and amalgamation was about two years afterwards erected at Dol-y-frwgnog, but, after operating on several hundred tons of quartz, the result was in this instance also a failure. Of all the auriferous veins in the neighbourhood of Dolgelly that at present worked in the Clogau Mountain is certainly the most important. This mine is situated at a height of about a thousand feet from the level of the sea, and the workings are extended on what is called the St. David's or Gold lode. This lode, which is almost perpendicular, runs nearly east and west, and is chiefly composed of auriferous quartz, more or less impregnated with sulphides of iron, lead, and copper. The vein stone also exhibits large quantities of disseminated gold, which generally occurs in a state of minute division. This mine is being worked on a small scale, and by means of very simple and far from perfect machinery. The following returns were, however, made during the course of the year 1861:—Ore crushed, 456 tons 32 lbs.; fine gold obtained, 2884 ozs. 1 dwt. 7 grs., being at the rate of 6¼ ozs. per ton of quartz operated on. During the current year, up to April 26, the results have been:—Ore crushed, 255 tons 16 cwts. 16 lbs.; fine gold obtained, 1902 ozs. 2 dwts., or 7½ ozs. per ton of quartz. It is needless to add that such a degree of success has given rise to the commencement of numerous mining operations in various parts of the district; but if gold mining in Merionethshire be approached in the speculative spirit that characterised the proceedings of 1852, it requires no prophet to foretel that numerous failures must necessarily be the result.

METHODS FOR EXTRACTING GOLD FROM ITS MATRIX.—The most simple and, at the same time, most ancient method for obtaining gold is undoubtedly by washing the sands and dirt with which it is found associated. On a small scale this may be performed either in a bowl or tin pan; but when greater expedition is sought recourse must be had to appliances of a somewhat more complicated nature. Among the earlier miners in California and Australia the "cradle" was much employed. This instrument appears to have been introduced from Virginia and Carolina, and consists of an oblong inclined box, having a sieve at its upper extremity mounted on rockers, so that, by means of a handle, it may be swayed from side to side. The interior of this case is provided with a sloping diaphram of tightly-stretched canvas, and the bottom is divided into partitions by means of wooden cleets. Washing by the cradle is, however, a very slow operation, and requires a great deal of manual labour, since, besides rocking, it is necessary to supply it with water by means of a dipper, and to continually stir the fresh-brought stuff deposited on the sieve. The gold and other heavy bodies retained between these wooden divisions are finally re-washed in a tin pan, and the metal thus obtained in a pure state. The loss of fine gold attending this operation is very great.

The arrangement which next came into general use among Californian miners was the "long tom." This consists of a long, roughly made wooden case, having a considerable inclination, and provided at its lower extremity with a sieve made of perforated sheet iron, beneath which is placed a "riffle-box," divided into compartments, as in the case of the cradle, by means of slips of wood. In the upper trough a stream of water is so directed as to fall with considerable force upon the auriferous drift with which it is charged, and this being continually stirred with a shovel, the finer particles are gradually washed through the sieve over the riffle-box, whilst the coarser fragments are from time to time removed, after being duly examined for any nuggets they may contain. The stuff retained by the riffles is afterwards washed in a pan, and the clean gold is thus separated. The tom has the advantage over the cradle of getting through a much larger amount of work within a given time; but it requires a much more plentiful supply of water, and the loss of fine gold is great.

When convenience exists for its introduction, the "sluice" has now generally superseded the tom. This arrangement is nothing more than a long run of wooden troughs, provided with false bottoms, in which auger-holes have been bored to a certain depth, and in which mercury is generally placed. Through these inclined troughs the "pay dirt" is washed, and the metal, from its greater density settling in the depressions at the bottom, and combining with the mercury placed there for that purpose, is thus retained. These false bottoms are occasionally removed, and the mercury separated from the gold by filtration and subsequent distillation. This process, although a certain portion of the gold is still lost, is generally much preferred to either of those above described. It is also now customary, whenever a sufficient fall of water can be obtained, to direct a stream, by means either of metallic tubes or canvas hose, against the bench of pay dirt it is intended to remove. A powerful stream playing against the side of a hill will in a short time disintegrate a large quantity of dirt. The rubbish thus detached is conducted through a sluice in the usual way, and the gold is in this manner separated and collected. This method of proceeding is known by the name of "Hydraulic mining," and is, generally speaking, considered the most economical that can be adopted. When, instead of being found in deposits of pay dirt, the gold occurs in veins, associated with other metals, it becomes necessary to reduce the gangue to a state of fine division before it can be extracted. Two distinct methods are employed for the separation of this metal from the matrix with which it is associated—viz., washing and amalgamation.

In some countries, and particularly in Mexico, the "arrastra" is much employed for the treatment of auriferous minerals. This consists of a vertical axis, provided with cross arms, to which are attached, by means either of ropes or thongs of untanned leather, two or more heavy masses of porphyry. Mules are harnessed to one of the projecting arms, and a rotatory motion given to the shaft. The stones thus set in motion are dragged over a well-paved bed, and thus, by an action somewhat resembling that of the common muller and slab, the ore is gradually reduced. Mercury and water are added to the ores operated on, and the resulting amalgam is from time to time passed to the retort. In some instances the ores are introduced into the arrastra in fragments of about the size of peas; but in large establishments it is first coarsely ground in a stamping mill. It is needless to say that grinding by means of the arrastra is a slow and expensive operation.

In Chili the "trapiche" is much used. This is nothing more than a grinding-mill,

like the ordinary edge-runner. The roller runs on a groved bed-stone, in which a certain quantity of mercury is placed, and by the continual trituration of the revolving runner the ore is gradually reduced and amalgamation effected. This is however, like the foregoing, a tedious and costly operation.

In some cases a mill like that commonly employed for grinding corn has been made use of, and found to answer remarkably well. In one establishment were apparatus of both constructions is in operation the ratio of the cost of grinding by the horizontal mill as compared to the edge runners is as 2s. 3d. to 6s. 10d. The ordinary roller crushing-mill has also been employed for the reduction of gold quartz previous to amalgamation, but it cannot be considered to be well adapted for this purpose. In the first place, the whole of the stuff coming from the mill has to be passed through sieves of fine wire-gauze, and these become so rapidly worn by the rougher fragments which are being returned to the raff-wheel as to render repairs constantly necessary, and the operation very expensive. Then, again, unless the ore be remarkably dry these sieves choke, and the stuff is carried round and round without passing through; and, finally, if the ore be dry, such a dust is created as to nearly choke those attending to the crusher.

Among the quartz miners of California and Australia the stamping-mill is now the machine almost universally employed. The ore is often first calcined in heaps or kilns, and, after stamping, the reduced mineral is passed through apparatus of various forms for the separation of the gold. The calcination of the quartz, although not always adopted, is frequently productive of advantageous results. Hard quartz is rendered much more friable by this treatment, and when a large proportion of sulphides is present the expulsion of sulphur by the operation of roasting is likewise beneficial. It is also probable that when gold occurs in thin finely-divided lamina the ignition of the quartz causes such an agglutination of its particles as to cause them to offer less surface to the action of the water, and that the loss of "float gold" is thereby diminished.

The metal is separated from the stamped ore either by washing alone, or by washing and amalgamation. When the former process is resorted to the stuff flowing from the stamping-mill is either allowed to pass over riffle-boxes, or is conducted over blankets, or skins on which the air is retained. These are occasionally washed in proper vessels, and the metal retained by them thus collected. The gold so obtained is, in most instances, concentrated by washing in a "batea" or otherwise, and finally amalgamated, or less frequently fused with litharge, or an ore of lead, and finally cupelled. When amalgamation is employed the riffle-boxes may be charged with mercury, or the auriferous sands produced can be passed through triturating apparatus containing mercury, with which the gold is caused to combine. In some cases barrel amalgamation is resorted to. The diagram on the wall exhibits a combination of three of the most efficient amalgamating appliances used by the miners of California and Australia, which is well calculated to separate the precious metal from ordinary gold quartz. The ore flowing from the mill first passes over a lip through a triturator, not unlike that employed at Zell, in the Tyrol, and then falls into an apparatus, the action of which is similar to that of the amalgamating barrel. Finally, the whole of the stuff, before passing over riffle-boxes or blankets, is agitated in a column of mercury, through which it is made to descend. In some instances, where water is not plentiful, that from which the tailings have settled is again pumped round. In this case a little wood ashes should from time to time be thrown into the mill. This is employed for the purpose of saponifying any oil or other fatty matter which, if present in *even the most minute proportions* when quicksilver is used, would, by preventing the particles of gold from uniting with the mercury, materially interfere with the results obtained. It is, therefore, of great importance in all quartz crushing and amalgamating establishments that proper care be taken to prevent any dropping of oil from the bearings into the apparatus, since the result of such an accident would inevitably be a notable failing off in the produce of gold obtained. In order to prevent loss occurring through this cause it would, as before stated, be found advantageous to throw from time to time into the mill a little wood ashes, or some other alkaline body, for the purpose of removing any greasy matter which may have become accidentally introduced. When the quartz contains an appreciable quantity of auriferous sulphides it would in many cases be found advantageous to separate these from the tailings by means of a Hundt's buddle applied to the end of the riffles. The sulphides thus collected might be treated either by fusion with oxide of lead, and the produce cupelled for gold, or after a preliminary roasting be again subjected to amalgamation. The former process will, however, in many instances prove the most advantageous.

As an instance of the small yield of gold which, even in Australia, is at the present time found remunerative, I would quote the following results of the Colonial and Port Phillip Company. It must, however, be observed that, to obtain a satisfactory profit from ores of this class, it is necessary not only that large quantities should be treated, but also that the greatest economy should be observed in every department of the manipulation. The quantity of quartz crushed by this company between Oct. 1, 1860, and Sept. 30, 1861, was 32,258 tons, from which the produce was 24,336 ozs. 6 cwts., being an average of 15·2 dwts. per ton. The quantity crushed during the preceding year was 21,693 tons, and the produce 17,466 ozs., being an average of 16 dwts. per ton, showing an increase in crushing of 10,563 tons, and on yield of gold of 6870 ozs. over the same period of the previous year. It will be perceived that the yield of gold per ton had experienced a variation of 22 grs., equal to 5¾ per cent. The total expenditure per ton has been 12s.; in the preceding year it was 16s. The profit on the quartz crushing for the year ending Sept. 30 was 22,958*l*. 16s. 5d.

ASSAY OF ORES CONTAINING GOLD.—Minerals containing gold are in most instances assayed in precisely the same way as those affording silver. To make an assay of auriferous quartz, the sample to be operated on is first finely pulverised, and a given weight subsequently well mixed with litharge, carbonate of soda, borax, and an amount of charcoal dust sufficient for the production of a button of lead of a convenient size for cupellation. The metallic globule remaining on the cupel after this operation will contain all the gold present in the ore, together with any silver that may be associated with it, as well as a certain minute portion of that metal derived from the lead of the reduced litharge. In case of the poorer ores containing less than 10 dwts. of fine gold to the ton, the silver derived from the litharge will frequently be found amply sufficient for the purposes of inquartation, whilst for the richer varieties the addition of a little pure silver at the time of placing the button on the cupel is often necessary. When, in addition to gold, the ore contains small quantities of iron pyrites, or other sulphurised mineral, it not unfrequently happens that the admixture of charcoal or any other reducing agent becomes unnecessary, and the fusion may be made with litharge alone. When, however, pyrites, blende, or other metallic sulphides are present in large quantities the sample must either be treated by scorification, or it must be first roasted until all the smell of sulphur has disappeared, and then treated as in the case of substances not containing that body, but with the addition of a large proportion of borax. It is, however, to be remembered that when any of these compounds contain sulphur it is of importance that the whole of it should be removed either before or during the process of obtaining the leaden button, since otherwise, and particularly in the presence of alkaline fluxes, a portion of the gold may enter in combination with the slags in such a way as not to be entirely separated from them by the action of metallic lead.

It may be proper to remark here that although nothing is more easy than to estimate with great accuracy the amount of gold contained in any given specimen of gold quartz, it is considerably more difficult to obtain a fair average sample of the usual produce of a vein. When the metal is in a fine state of division, and equally disseminated throughout the gangue, this presents less difficulty; but when, on the contrary, it occurs in pockets and irregular deposits it frequently requires the exercise of great care in order to avoid falling into very serious errors. It is consequently of the highest importance that whenever ores are to be assayed for gold the greatest care should be observed in preparing the samples on which the operation is to be conducted. With this view the heaps or piles should be fairly cut through, 2 or 3 tons being taken from each parcel of importance, and reduced to fragments not exceeding the size of beans; this may be effected, when crushing machinery is not available, by breaking the ore by the aid of properly-shaped hammers on iron plates. This operation is technically called "bucking." The ore thus prepared is now to be thoroughly mixed, again made into a pile, and again cut through, taking out of it this time from 3 cwts. to 4 cwts., which are reduced to the state of fine powder, either in a large mortar or by grinding on an iron plate. After well mixing, this powder is again cut through, and about 20 lbs. weight taken, for the purpose of being still further reduced in size, and passed through a sieve of fine wire-gauze. Should any flattened particles of gold remain in the sieve they are to be carefully collected, cupelled, and parted, and due allowance made for them in the result obtained by direct assay. Of the finely-divided ore which has passed through the sieve at least six different assays of 1000 grains each should be made, and their mean result taken as representing the produce of the parcel of ore of which it is the object to determine the value. By operating in this way almost absolute accuracy may be ensured; but when a less degree of exactitude is necessary the quantity of crushed ore may be reduced, and the number of assays fewer.

If after thus accurately testing the produce of a parcel of ore, it be passed through the most efficient crushing and amalgamating machinery with which we are acquainted, it will be found that the total amount of gold originally present in the stuff is never obtained, and if this deficit be sought for in the tailings resulting from the operation it will be discovered that a certain small quantity of the precious metal still remains unaccounted for. This deficiency would appear to be due to the circumstance of minute particles of flattened gold having floated off on the surface of the water, and frequently amounts to nearly 2 dwts. per ton of ore treated. When the ore to be examined contains silver in addition to gold, and it is desirable to ascertain its amount, it becomes necessary first to cupel the button of lead without the addition of silver; the metallic globule thus obtained is weighed, and its weight noted, deductions being made for the weight of silver derived from the reduced litharge, which must be ascertained by a distinct cupellation. If more silver is required for the operation of parting it is added, and the button, together with the fragment of silver, enveloped in a piece of pure lead foil, and again cupelled. Lastly, the resulting globule is dissolved in nitric acid, and the gold weighed. The weight of silver present in the ore will consequently be represented by that of the button of alloy obtained from the first cupellation, less the united weights of the gold and the silver resulting from the reduced litharge. In concluding this subject I cannot better express the great importance of obtaining fair samples than by quoting the words made use of by Dr. Percy, in a lecture delivered in 1852, at the School of Mines, who, when speaking of gold assays, said—"Above everything be particular in obtaining an honest and fair sample. This is a matter of paramount importance, and of no small difficulty in many cases, but let there be honesty of intention, and this difficulty will be generally surmounted."

GOLD MINING SPECULATIONS OF 1852.—Shortly after the discovery of the gold deposits of California and Australia numerous associations were organised in the United Kingdom for the purpose of working gold mines in those countries, and I regret to say that, in almost every instance, these have resulted in the total loss of the capital so embarked. Various circumstances have contributed to produce these disastrous results, but none more so than the fact that, in too many instances, sufficient attention had not been paid to obtaining samples fairly representing the average produce of the various veins which it was intended to work. The specimens which reached this country were often picked samples, and on being placed in the hands of the assayer yielded a produce which was far from realised when fair average samples of the leads came to be tested on a large scale. Then, too, it was not unfrequently found that quartz veins, producing what should have been a remunerative amount of the precious metals, were situated in localities in which, either from the want of water or some other cause, their exploitation was attended with extraordinary difficulties. And, above all, the excessive price of labour, and all other mining requisites which then prevailed, was, in most cases, a sufficient barrier to anything like remunerative returns to the proprietary. It is sufficiently evident that in a country where an egg sells for a shilling and a fowl for a guinea a much larger amount of gold will be required in order to afford remunerative results than in one in which the necessaries of life can be procured at a more moderate rate; and it is also much less difficult to control the labour of a large staff of operatives where employment is comparatively scarce, than where any man of moderate industry may, by working on his own account, earn nearly 20s. per day. The natural effect of such a state of society being that, in the first place, work of all kinds is necessarily expensive, and, secondly, that the supply of labour is very precarious.

In all rich and newly-discovered gold districts, which have for the most part a very limited resident population, the alluvial and easily-worked deposits afford for a considerable time a superabundance of remunerative occupation for the newly-arrived immigrant, but as these gradually but slowly become exhausted, something more than mere muscular strength becomes necessary in order to keep up the returns, a more systematic method of mining is adopted, a thorough combination of labour and the investment of larger capitals are required. It must, however, be remembered that these changes, although gradual even in a new colony, are infinitely more rapid than those who have always resided in European countries generally imagine. Ten years in the life of a colony, and particularly a gold-bearing one, effect greater changes in its commercial and social relations than a century in an old established country, and we have, consequently, no reason to be astonished that veins are at the present moment being advantageously worked both in Australia and California when in 1852 such operations would have been attained by a certain and very considerable loss.

It is a generally admitted fact that veins of auriferous quartz have little or no relation, with regard to the expense of working them, with the more readily worked alluvial deposits in their vicinity. In the one case the rock has to be broken, crushed, and washed, at a considerable expenditure of time and money, whilst in the other Nature has for centuries been carrying on these operations, and so preparing the gold as to admit of its extraction by very simple means. It consequently follows that the period at which quartz veins can be advantageously worked in any given locality will not entirely depend on their yield, but will also be more or less influenced by the abundance and richness of the alluvial diggings in their vicinity, and the general price of labour and materials in the district. The supply and consequent price of labour must also be materially influenced by the distance at which the gold-producing countries may be situated from the great centres of civilisation. From their remoteness and their consequent difficulty of access, Australia and California for a considerable period offered striking examples of the demand for labour exceeding the supply, but the constantly increasing facilities afforded for travelling, and in some instances their nearer proximity to Europe, will probably prevent this occurring to the same extent in the more recently discovered gold fields. There is, therefore, every reason to believe that the amount of gold annually derived from the working of gold quartz will go on gradually and rapidly increasing; and that, by the introduction of efficient and powerful machinery, ores of a very low produce will ultimately be treated with advantage. These observations particularly apply to the province of Nova Scotia, whose geographical position renders it impossible that labour should ever attain an excessive value, whilst, if a large supply of auriferous quartz can be obtained from the mines of North Wales, it is evident that a very small yield of gold, if continuous, might be rendered remunerative.

The operations of separating oxide of tin from its matrix, and gold from its ores, are, in many respects, exceedingly analogous, and, consequently, the expenses incurred in the one case may (all other circumstance being the same) serve approximately as a guide for estimating the cost which should be incident to the other. The most efficient apparatus employed in this country for the reduction of ores to the requisite degree of fineness are undoubtedly to be found in the tin mines of Cornwall; and as an example of the expense attending the process of stamping, it may be stated that at Polberro Consols, in the year 1854, a 36-in. condensing engine, working at 55-horse power, stamped no less than 30,200 tons of tinstuff, at a total expenditure of 1s. 3¼d. per ton. Each head stamped, therefore, 420 tons per annum, or 28 cwts. per 24 hours, whilst the whole number reduced 100 tons per day, at a cost of 2s. 4d. per horse power. During the same year the average produce of the stuff stamped was 20¾ lbs. per ton, and the nett profit on the operations 2350*l*. 9s. 8d. If we now assume the value of black tin to be 8d. per lb., and that the expense of stamping an equal quantity of gold quartz would have been the same, the total value of the produce obtained from each ton will be 13s. 10d., or equal to a yield of about 3¼ dwts. of fine gold. It must, however, be admitted that the cost of stamping a ton of ordinary gold quartz will be somewhat greater than that of treating an equal quantity of Polberro tinstuff, and that when the gold is in an exceedingly minute state of division, or when sulphides are present in large quantities, the separation of the gold may sometimes be attended with a certain amount of difficulty, but this difference will, in many cases, not be material. It is, therefore, evident that when large quantities of auriferous quartz can be obtained, in a country where the price of labour is not high, it is not necessary that it should contain a large amount of the precious metal in order to render its treatment by the aid of well-constructed machinery remunerative. As an instance of the very small yield which, under peculiar circumstances, may be rendered available, I would adduce the fact that at Schemnitz, in Hungary, in the year 1842, the total quantity of ores stamped was above 40,000 tons, and the average of the useful metals extracted from 50 tons was—gold, 3 ozs.; silver derived from the separating process, 3¾ lbs.; lead similarly obtained, 5½ cwts.; the ratio of the gold to the other materials being here as one to half a million. It is also important to state that in this instance the ores had to be broken from solid lodes, at depths extending to 200 fathoms from the surface.

The paper was amply illustrated by diagrams prepared by Mr. Phillips; the model of the "Welcome" nugget, and a large number of minerals bearing on the subject, were exhibited by Prof. Tennant; and a working model of the gold amalgamating machinery invented by Mr. John Mitchell, F.C.S., was also in the room. The paper having been read, the President (Mr. THOMAS SOPWITH, M.A., F.G.S.) said that he would be glad to hear any remarks upon it from those present; and, with a view of opening the discussion, he would request Mr. Mitchell to describe the model of his gold amalgamating machinery.

Mr. MITCHELL said that the object of the machine was to further crush the gold-bearing ore after it left the stamps. It was well known that it was necessary to treat it in a triturating machine of some kind, and a species of common corn-mill had generally been employed; he believed that the machine before them effected the trituration far more perfectly. It would be seen that it was a modification of the mill used for grinding coke for foundry purposes, and indigo for dyeing. The triturator consisted of an annular basin, in which four balls were placed, such balls being made to run round the basin by the four arms attached to the cross piece above. In this driving, however, he had introduced an improvement. It was usual for the ball to be driven by the simple pressure of the straight arm against it, the consequence; being that the ball running like a cart-wheel soon becomes oval. To remedy this evil the balls were driven, in his machine, by small conical rollers placed at the bottom of the arms, the consequence being that the balls are given a double motion; they revolved, as it were, on two axes. The effect of employing this machine is, that each particle of gold becomes polished, and is thus more ready to be taken up by the mercury. The stuff after being reduced to a fine powder in the triturator, passes through a series of amalgamators, each consisting of a chamber divided into two compartments, in which Archimedian screws revolve in reverse direction. The number of these amalgamations is increased or diminished according to the character of the ore. As an example of the efficiency of the machine, he might state that in one case he operated upon ore which contained by assay 3 ozs. 11 dwts. 20 grs. of gold: after passing through the first amalgamator there remained 2 ozs. 5 dwts. 17 grs.; the second amalgamator extracted 19 dwts. 14 grs.; the third, 13 dwts. 1 gr.; the fourth, 4 dwts. 13 grs.; the fifth, 3 dwts.; and after passing through the sixth, but 2 dwts. 2 grs. remained in the tailings—3 ozs. 9 cwts. 18 grs. of the 3 ozs. 11 dwts. 20 grs. having been recovered; and it was probable had there been additional amalgamators the remaining 2 dwts. 2 grs. would have been got out. In another case, he operated upon an ore which contained by assay 38 ozs. 12 dwts., and the result was that he obtained in the first amalgamator 16 ozs. 12 dwts.; in the second, 10 ozs.; in the third, 8 ozs.; in the fourth, 2 ozs. 4 dwts. in the fifth, 19 dwts.; in the sixth, 8 dwts. 19 grs.; in the seventh, 4 dwts. 5 grs.; and in the eighth, 1 dwt. 23 grs.=38 ozs. 9 dwts. 23 grs., showing that the amount left in the relave was but 2 dwts. 1 gr. The application of the machine was based on the fact that both gold and silver require in their amalgamation a large surface of mercury to be exposed. In his machine the ore being operated upon was exposed to a surface of 250,000 square feet in the course of an hour, which is a far larger surface than that offered by any other machine. At the St. John del Rey Mines the ore is generally much richer than elsewhere, being dressed up from 1½ oz. to about 36 ozs. to the ton. The stuff is there kept in contact with the mercury 36 hours, which, owing to the small surface, was necessary; though in his machine the amalgamation would be effected in three hours. For it should be remembered that the larger the surface of mercury exposed the less would be the time required to complete the operation. He considered it was very objectionable to grind and amalgamate in the same vessel, and believed that in the *trapiche* the mercury is so ground up with the mineral as to form a mercurial compound—such, for example, as the preparation of mercury and chalk. If he had failed to explain the whole of the details clearly, he would be glad to answer any question put to him.

Mr. JOSIAH HARRIS said that in 1854 he resided for some time in Wales, and had taken great trouble in exploring the auriferous deposits. He thought the district had been curtailed by Mr. Phillips, as he considered it extended over 60 square miles, and contained numerous auriferous quartz lodes—in fact, that they were inexhaustible. The St. David's lode was not, he thought, vertical, as Mr. Phillips had described it, but dipped north about 18 in. per fm. It is rich in visible gold from the surface to the depth of 36 yards, and within the last few days discoveries had been made at still deeper points, fully proving that the gold deposits were not mere surface deposits. In 1853, Mr. Goodman found 250 tons of auriferous quartz in the neighourhood, which was dressed as copper ore, copper being also contained in it, and sold to the smelters, who found out its richness for gold, and expressed the desire to have more of it, but from some reason the supply was not continued. When Berdan's pans were first tried down there they did not succeed when ore rich with visible gold was placed in them, and the gold was not extracted. Within the last two years, however, better results had been obtained, owing to a different system of working being pursued. Formerly they treated from 6 to 10 tons of stuff per day, now only 20 or 30 cwts. At the present time, again, only one ball was used instead of two. It had now, he thought, been proved beyond question, not only that the deposits in Merionethshire were the richest known in this country, but also in any other. The stone which he had placed on the table would give, he would undertake to say, a yield at the rate of 3000 ozs. per ton, and it was by no means an isolated specimen—at the International Exhibition there were large rocks of ore equally rich. He thought we had now so far progressed that the gold deposits of Wales could be worked to great profit. To pass for a few moments to the Cwmhesian. In 1854, the mine was worked, but had since been suspended. The deposits, however, were precisely the same as at Dolfrwynog, and the yield was never less than 15 dwts. of gold per ton at Cwmhesian—the concentrated ore being worth 300 ozs. per ton. There is no difficulty whatever in making the Cwmhesian as good as the Clogau. At Dolfrwynog, 12 ozs. of gold had been washed out by hand, at a cost of 3*l*., and he thought that the whole district would be found of equal richness. It was an important fact that at the Port Phillip Company's works ore containing but 10 dwts. 8 grs. of gold per ton could be profitably treated, and that the total cost incurred was but 8s. 4d. per ton of ore treated. From this he considered they might fairly draw a conclusion with regard to Wales. If in Australia, where labour, fuel, and machinery were all more costly than in Wales, ore containing but 10 dwts. 8 grs. per ton could be treated at 8s. 4d. per ton, and leave a large profit, he thought that there must be a fair chance for the Cwmhesian, where the ore would give 15 dwts. per ton, and where there were great facilities for obtaining labour, fuel, and materials.

Professor TENNANT said that he had placed the model of the "Welcome" nugget on the table, and he had with him the first nugget brought from New South Wales to England, in 1851—the nugget which created such a sensation in the first International Exhibition, and led some timid folks to fear that the value of sovereigns would soon be worth not more than half-a-crown each. He need not say that these fears had not been realised, sovereigns continuing to be quite as valuable as ever; though from the commencement of gold working in Australia we have received, up to the present time, no less than 100,000,000*l*. worth of gold, or in weight over 1000 tons. He would ask them to examine a specimen of the gold-bearing rock from Nova Scotia, which was extremely interesting, not only from its richness for gold, but as a specimen; it showed the chlorite, schist, quartz, and the vein of gold. In appearance it much resembled a stone offered him some years since by Mr. Catherwood, for 25*l*., which amount he refused to give, thinking it too hazardous a speculation, but when melted down the stone was found to contain 42*l*. worth of gold. With respect to new gold fields, he thought they should consider whether gold is the only substance that will remunerate the worker. It should be recollected that in Australia a black substance was found, which was at first supposed to be titaniferous iron, and thrown away as useless; it had since been found to be a rich oxide of tin, and was now marketable on the spot at 40*l*. per ton. He had placed a box of precious stones upon the table, and doubted whether there were 20 persons in the room who would recognise them as valuable in their present state. If any of the members would go to the Netherland department of the Great Exhibition at the present time, they would find an extremely valuable collection of diamonds exhibited by Mr. Koster; they were estimated to be worth 1,600,000*l*., and he had no doubt that they were, yet, if they were thrown down in the London streets, he doubted whether anyone would consider them worth picking up. In Brazil there is a gold deposit of great value, the gold occurring in a great quartz, which may be crushed between the fingers. The climate was at present unhealthy, it was true, but as railways were now opening up in Brazil, he had no doubt the district might be opened up at no distant time. There were so many applications for gold—applications where it could never be recovered, owing to the cost of working far exceeding the value of the gold—that it would be very many years, even with a continual increase, before there could possibly be any inconvenience or change of value from superabundant supply. Silver, copper, tin, antimony, bismuth, nickel, and other metals would in many cases prove as profitable as gold itself; and if they could find the latter specimens of diamonds, which were now simply called carbon, and sold at 50*l*. per ton, per ton. It would admit of the profitable employment of many minerals which were unmarketable, owing to the great cost incurred in treating them. To his mind the paper which Mr. Phillips had read was one of the most useful which had been read for some

Mr. EVAN HOPKINS had listened with great pleasure to Mr. Phillips' paper, which left very little to be remarked upon, but speaking generally on the subject of gold formations, and the systems of extracting it from the ore, according to his own experience, they had very little difficulty commencing in a gold field to find the gold, beginning with the outcrop, and washing out the gold from the debris. Again, with regard to the quartz veins, when the rock had been washed away, they found no difficulty whatever in extracting the gold from the quartz. The Port Phillip Company commenced their operations on a quartz vein which yielded on the surface 10 ozs. to the ton; it afterwards diminished to 6 ozs. as the quantity operated upon, and the depth of the workings increased, the average yield diminished; but in consequence of the introduction of stamping and the Berdan system, as applied in South America, they were now able to make a profit with ore producing only 10 dwts. per ton, and they in South America continued to make a profit with a yield as low as 6 dwts. per ton, provided they got 2000 or 3000 tons of stuff per month of that average quality. They found no difficulty in getting the remaining gold from the remains of the quartz by re-treatment, and the use of finer stamps. At first when they used the Chilian mills with mercury, they could not make ¾ oz. per ton profit. He was happy to say they could now work material yielding only 6 dwts. a profit without quicksilver. The Columbian Mining Association had tried all kinds of machines and grinders, such are those represented, and many more, but they had proved worthless. By grinding the raw material into an impalpable state in the first instance, they destroyed a large amount of the rough grain gold; and notwithstanding the grinding with the quicksilver for days together, there was a large amount of gold which did not become incorporated with the quicksilver, and that was a case of great loss. That system was abandoned, and from that time they had been working on the refuse of the mines at a profit. All they wanted was plenty of material, which yielded gold even as little as 6 dwts. to the ton. With regard to North Wales, there was no difficulty in getting out the gold. He had been lately at the Clogau Mines. In one he saw 9½ lbs. of gold obtained from 500 cwts. of quartz by the pestle and mortar machinery, and when they put up stamps he had no doubt they would get a greater yield and would be able to reduce comparatively poor stuff with profit. The cost per ton at the Clogau, with their present mode of extraction, must be excessive. The cost of extraction at Marmato did not exceed 8s. per ton. With reference to the St. John del Rey, the material they were working upon only yielded 37s. worth of gold per ton, and they were making a profit of 8000*l*. or 9000*l*. per month, as the cost of producing was only 17s. per ton, leaving a profit of 1*l*. per ton; but they could not do that unless they had a great abundance of material to operate upon.

Mr. HARRIS observed that Mr. Hopkins had said that the amalgamation process was not in use at the Port Phillip works; he would, therefore, request the secretary of the company, whom he saw in the room, to state whether the amalgamation process was in use there?

Mr. FIELDER said that they did amalgamate. The process employed at the Port Phillip Company's works was a mixed process.

A VISITOR observed that he felt much interested in the subject, and had collected that some years ago there was a rumour of gold being found in Scotland, since now we hear nothing about it. He would be glad to learn whether gold could be obtained in that country?

Mr. HOPKINS had no doubt that if some of the Australian diggers were to go to Scotland they would very soon find gold. Indeed, it was always found in primitive rocks.

Prof. TENNANT was stopping at Lord Breadalbane's last year, and looking round the neighbourhood he found quartz with gold and iron pyrites in it; it would probably cost 30s. for each 20s. worth obtained, which, as a commercial speculation, might not appear a desirable one to all parties.

Mr. HOPKINS said that the rule was to examine the edge of the primitive rocks when they were searching for gold.

Mr. PHILLIPS remarked, in reply to Mr. Harris, that it was possible he had underrated the extent of the gold-bearing districts of North Wales, but he believed he was quite correct in stating that the whole of the veins hitherto worked were comprised within the area mentioned. With regard to the roasting of gold quartz, referred to by Mr. Hopkins, he was only aware of one instance in which it appeared to have been attended by prejudicial effects. In this case the ores contained large quantities of sulphides, and that gold existed in a state of minute division, and that on washing the heaps, with a large excess of wood, a portion of the gold appeared to have been carried off in washing in the form of alkaline double sulphides. In reference to the observations of Mr. Tennant respecting the Canadian gold fields, Mr. Phillips remarked that he had visited them nearly 10 years since, but their produce was so small as scarcely to render it necessary to include Canada among commercially gold-producing countries. With regard to speaking of Nova Scotia, however, he (Mr. Phillips) had omitted to mention that he had on the day previously received a letter from his friend, Mr. Annand, the Financial Secretary of the province, who stated that at Sherbrooke, which at the time of Mr. Phillips' visit, in November last, was entirely without houses, a small town and hotel, and all requisites, had sprung up, and that three crushing mills were already in progress of erection, the largest and most efficient of them having been forwarded from England by the London and Nova Scotia Gold Mining and Crushing Company (represented in England by Mr. Weir), who have obtained from the Government leases of some very valuable quartz veins, situated at Sherbrooke and other localities in the colony.

Mr. HOPKINS wished to explain that he spoke of roasting only with respect to the Port Phillip ores, where in roasting the silver goes off.

The CHAIRMAN, in moving the vote of thanks, said that he was sure they would all agree with him as to the great value of Mr. Phillips's paper; he had seldom listened to a paper in which a subject has been more clearly brought forward. For his own part, he considered that the real interest of the subject rested upon the extraction of the gold, which occurred in a state of very minute division, since it was there that we must look for profits. Many of the remarks in Mr. Phillip's paper must be of the greatest possible use both to those supplying funds for the working of gold properties, and to the gold-seekers themselves. He considered that Mr. Phillips had laid the Society under a great obligation to him, and he, therefore, seconded the vote, which Mr. Phillips had read was one of the most useful which had been read for some time.

Mr. PHILLIPS, in reply to the peculiar contorted formation mentioned by Mr. Phillips, he thought it was highly interesting, and he would, in connection with it, remark that in the International Exhibition, in the Belgian department, would find maps of formations met with in that country where the contortions were still more remarkable. Mr. Phillips had told them that in a new colony the work effected was as great as a century would produce in an old country—a statement he entirely agreed with. To confirm it they need only refer to Australia—the colony of Victoria. In the course of the 10 years since the first nugget was brought over, improvement had been marvellous. In 1851 the export of gold was 145,166 ozs., value of which was 580,527*l*.; whilst in 1860 it was 2,156,660 ozs., worth 8,626,640*l*. the aggregate in the 10 years being nearly 24,000,000 ozs., of the value of 93,672,000*l*. This was according to the Customs' returns, but if they added the amount brought privately, the value would be raised to the enormous amount of 103,941,976*l*. Those who were desirous of possessing further information on the subject should consult volume now in the International Exhibition, sent over by the colony. The information was collected from the various districts, and recorded in the volume in the most beautiful penmanship, with illuminated capitals; it was well worthy of inspection.

He then formally moved the vote of thanks, which, having been carried by acclamation, and acknowledged by Mr. Phillips, the meeting separated.

THE DISCOVERY OF LONDON FIRES.—Mr. Frederick Hodges, the eminent distiller, of Lambeth, is having a fire observatory of a somewhat novel construction erected on his extensive premises, by means of which the exact position of a fire may be determined, a point of great importance as the experience of the London Fire Brigade will fully testify, engines having frequently gone considerably out of the way when attracted from their station by the glare of extensive conflagration. The observatory in question has been designed, and is now constructed by, Messrs. Charles B. King and Co., of 20, Abingdon-street, Westminster, the engineers to the distillery. It consists of a wrought-iron mast, having a diameter of 18 inches at bottom and 12 inches at the top, a gradual taper the whole length from the top, and at an elevation of 110 feet from the ground, will be erected a platform stage, to which access will be obtained by means of a set of differential pulleys, hauling a chair to be worked by the person ascending. We have often read the proceedings of Mr. Hodge's Volunteer Fire Brigade with a view of noting the gentleman's strenuous and praiseworthy exertions in the protection of life and property from fire, and in recording this last extensive project we can only commend his exertions, and the careful consideration of fire insurance companies and other private brigades. We are informed that the handsome fire-engine about to be presented to Mr. Hodges by the inhabitants of Lambeth and the metropolis is now nearly completed; the decorations, which are of great merit, are being executed by Signor G. M. Casentini, of Hanover buildings, Westminster-road. The presentation will take place on the 20th inst., at which the engine will be placed in the International Exhibition.

COLLIERY EXPLOSIONS.—The precautions hitherto adopted to prevent the explosion of fire-damp in coal mines have failed to achieve the purposes designed, and the constant recurrence of sad catastrophes arising from this cause clearly demonstrates the necessity of providing more effectual remedies. With this object in view, a novel expedient is suggested, which at first appear visionary and chimerical, but when attentively applicable—namely, "that experiment, will prove scientifically correct, and practically mination of coal mines with gas." A project of the kind presents the advantage of being easily accomplished at a moderate cost. The article can be manufactured in a convenient spot for use, with materials ready at hand, while the construction of the requisite apparatus merely demands the degree of ingenuity and skill usually exercised in such matters. The laying and fixing of the pipes, in proper positions, and at regulated distances, in the different chambers of the pit, forms an undertaking that involves little difficulty in the execution. The process of igniting the gas, almost instantly, throughout the whole concern, can be managed without personal danger, by the agency of a voltaic battery conducting wires, with platina points attached to each burner—the medium employed to emit the sparks. The flame must be carefully protected by means of safety-lamps, durable in size and guarded from injury, being the destructive element that surrounds the principle to obviate the chance of contact with the combustible gas, by means of fine gauze-wire covering. In consequence of the arrangements gradually consumed by the electricity with which the fire-damp is surcharged becomes gradually combustion, imparting brilliancy to the enclosed light, and, in this mode, the explosive properties of the insidious enemy are absorbed without risk. The additional benefits to promote ventilation, and serves to purify the atmosphere from noxious ingredients. diffusion of adequate light in quarters obscured by darkness will afford incalculable

to the workmen engaged in these perilous occupations, and facilitate the laborious of conducting subterranean operations. In the progress of discovery, electrical light supersede gas, being not only cheaper and more vivid, but free from smoke; consequently the lamps are preserved clean, and kept in order, with little trouble. Should success of the enterprise correspond with the anticipations indulged, and the interesting problem receive a satisfactory solution, an important branch of industry will acquire a fresh stimulus, attended with invaluable benefits to humanity, in diminishing the casualties incidental to pursuits peculiarly hazardous, and often deplorably fatal.—R. J. K.

BEARIZ TIN STREAMING COMPANY.

The first general meeting of proprietors was held at the offices of the company S serjeants-inn, on Tuesday,

Mr. JOHN WALKER in the chair.

Mr. A. STRACHAN (the secretary) read the advertisement convening the meeting. The report of the directors was read, as follows:—

Report presented by the directors to the shareholders at the first general meeting of the company, on Tuesday, May 13, 1862:—

In submitting their first report, the directors have the pleasure to lay before the shareholders a summary of their proceedings, from the commencement of the company; and a statement of the accounts, showing the financial position of the company on March 31 last.

The prospectus of the company was issued on April 10, and the list of applications for shares was closed on May 13 last, when more than the number of shares required by the prospectus to be subscribed for prior to any allocation being made was found to have been applied for, and the allotment letters were issued, and the company duly constituted. Your directors, having great confidence in the undertaking, did not press the disposal of the remaining shares, but have from time to time allotted such further shares as were applied for, and on March 31 last, when the accounts were closed, the whole of the shares had been allotted, with the exception of 1000 shares reserved with a view to such an arrangement with the mining manager as will give him an interest in the success of the company. The immediate and primary object of this company, as stated in the Articles of Association, was to acquire a perpetual lease of 31 pertinencias, or setts of mineral land, forming an extended chain or series of tin mines, belonging to Senor Don Domingo Antonio Merelles, at Beariz, in Galacia, in Spain; and powers were further given, and may be exercised whenever it may be considered desirable to do so, to acquire by lease, purchase, or otherwise, from the Spanish Government, or any private person or public company, any other property or interest in the same, or privileges in Spain, which may from time to time be deemed suitable for mining or other purposes, or exclusive to the attainment of the above objects, and also for the purpose of selling or letting, or otherwise disposing of, as may be deemed most advantageous, all or any of the property so contracted for or hereafter to be leased, purchased, or acquired, or otherwise realising the china-clay, ores, and other produce thereof, and the converting into porcelain or pottery the china-clay so to be obtained, and the smelting and converting and vending of such porcelain or pottery, and metals so to be obtained: and the erecting of such buildings and machinery,—and the doing all such other things as are incidental or conducive to the attainment of the above objects, and also for the purpose of selling or letting, or otherwise disposing of, as may be deemed most advantageous, all or any of the property so contracted for or hereafter to be leased, purchased, or acquired, or otherwise changing the same until the disposal thereof for the benefit of the company."

The company being constituted, the directors proceeded to carry out the objects thereof. With as little delay as possible your directors took steps to make absolute a conditional contract which they had entered into, by obtaining a lease from Senor Merelles; the necessary deeds to this effect were executed in September last, giving a perpetual lease determinable by the lessees at any time on eight months' notice) to the company of the 31 pertenencias. The consideration agreed to be given for the lease is 1000*l.* in cash, and 10 fully paid-up shares (not to carry dividends in any year until after a dividend of 5 per cent. for such year be paid on all the other shares of the company), and a rent of 50*l.* per annum. Four other pertenencias, rich in tin-bearing kaolin, and situate on the same lodes as those leased from Senor Merelles, and which it was considered desirable to secure in order to make the property of the company still more complete, have been since acquired from the Government, through Senor Merelles, free of rent, and subject only to the usual royalty of 3 per cent. on the produce of the mine or mines, which may be worked in the said pertenencias, to the Crown. Some little delay in commencing operations arose from the difficulty experienced in engaging a suitable and thoroughly qualified mining manager, but in September last the services of Mr. Gustav J. Gunther, well known as a scientific and practical miner, were secured as mining manager of the company in Spain, for a time, to lay out and open up the mines. He at once proceeded to Spain, and arrived at the mines on Oct. 3 last. Some miners and mining mechanics from Cornwall were immediately sent out to Beariz, and also the necessary tools and implements, and on their arrival at the mines operations were forthwith commenced. Satisfactory arrangements were also made with the highly respectable firm of Messrs. Ibarra Hermanos, of Vigo, to act as the mercantile agents of the company in Spain, and advances, to defray the expenditure at the mines, are made by them as is found to be necessary; they reimbursing themselves by drafts on the company. The properties acquired by the company consist of two distinct species of tin mines: one being tin-bearing kaolin, or china-clay; the other quartz lodes yielding tin. Of the former (the kaolin) there are 28 pertenencias, 24 of which were acquired under the lease from Senor Merelles, and 4 have been acquired since the lease was executed: of the latter (the quartz) there are 7 pertenencias acquired under the lease. These 35 pertinencias form three distinct groups of mines, five of which are kaolin and four quartz, as shown in the following—

TABULAR STATEMENT AND RELATIVE PLAN.

Name of Mine.	Names of each pertenencia in group.	No.	Total.	Acres.	Total.
	KAOLIN GROUPS.				
San Miguel	San Miguel (1), S. Gerardo (2), F. Fraternidad (2), S. Guillermo (2), Antonia (2), La Union Anglo Espanola (1), Gustavo (2)	12	.....	138	
San Francisco ..	San Francisco (2), S. Federico (2)	4	.....	46	
Santa Matilde ..	S. Matilde (2), S. Vicente (2)	4	.....	46	
Rosario	El Rosario (1), S. Patricio (1), Corsario (1)..	3	.....	34½	
Santa Amalia	La Amalia (2), S. Adolfo (1), La Suerte (1), Magdelena (1)	5	=28	57½	=322
	QUARTZ GROUPS.				
Aurora	Aurora (2), S. Ricardo (1)	3	.....	34½	
Tojalino	Tojalino (2)	2	.....	23	
Estrella	Estrella (1)	1	.....	11½	
Carmen	Carmen (1)	1	=7	11½	=80½
Total		35			402½

The tin which had been obtained from these properties prior to their acquisition by the company was chiefly extracted by ventureros, that is to say, by native peasants living in the district where the mines are situated, who were allowed by Senor Merelles to work where and when they pleased, and were paid by him a certain price for each load and weight of tin ore delivered at the smelting-works. The mode of working of the ventureros was extremely rude and ineffective; they were accustomed to raise the tin by digging shallow pits or holes, which either a fall of overlying surface earth or rock soon filled up and put a stop to further operations in them. Their washing or dressing process was equally imperfect. The kaolin when raised was carried (often on women's heads) to water, where they clay was washed out—the rough and find sand coming the tin separated by hand—the fine sand washed till the tin ore therein was fit for the smelting-works, and the rough sand thrown to the waste heap, though containing considerable percentage of tin,

The process of tin-streaming in Cornwall and other places, where it is well understood and skilfully carried on, is as follows:—The overburden, or surface earth, is first removed from the kaolin, an abundant supply of water is brought by leats to the top of the kaolin, as it flows down over the mass continuously carries a portion of it to its base, where the tin ore is extracted, and secured by machinery and appliances of the most approved construction, the water and clay passing through a drain or an adit constructed for the purpose.

The instructions which your directors gave to Mr. Gunther on his leaving England for Beariz may be shortly stated in general terms, as follow:—1. He was requested to inspect, examine, and report on the mines.—2. He was recommended to continue, at all events for a time, until tin could be extracted by operations to be carried on in a regular systematic and skilful manner, to allow ventureros to work, and to purchase the tin ore raised by them, but to take especial care to confine them to spots where their mode of working could not be prejudicial to the future interests of the company.—3. He was directed to plan his first operations in such a manner as that, while they should be suitable and effective for their own immediate purpose, they would be adapted to form part of subsequent workings to be planned and carried out on a large scale.—4. The desirableness of commencing operations on a limited scale, cautiously, and extending them gradually as an accurate knowledge of the real character of the mines so acquired might warrant, was impressed upon him.

Mr. Gunther, in his first report, states that the kaolin is inexhaustible in quantity, rich in tin, and from its nature admits of the tin being easily extracted; also that the quartz lodes are rich, the supply of water at all the pertenencias abundant, the configuration of the ground favourable for working, and generally that the property is a first-rate one, being, as it were, the cream of all the mineral deposits of the district, and so placed as to exclude competition, and capable of being developed to a most gigantic extent.

Ventureros have been allowed to work at selected spots, and several tons of tin ore have been so obtained by the company at a very moderate cost, but their mode of working is not one that is considered desirable to encourage, and it is the intention of your directors, at the proper time, to disallow its practice on the properties of the company.

The principal operations of the company have been carried on at the group of mines called San Miguel, and in a great measure confined to the one pertenencia of San Miguel proper. The overburden, or surface earth, to be removed from above the kaolin ranges from 6 to 18 feet in thickness. A tramway of 320 feet in length has been constructed for this purpose, several thousand tons of the overburden have been removed, and a surface of kaolin ready for operating upon, of several hundred square yards in extent, has thus been exposed. An adit, or underground drain, to carry away the water now being brought over the kaolin and used in washing it, is far advanced, and progressing in a most satisfactory manner. These operations will be further carried on, at least, or leats, for bringing in the water formed during the summer months, and the mining manager estimates that the kaolin, which may be streamed or washed early in the season from the part of this pertenencia from which the overburden will then have been removed (reckoning that the top part of the mass of kaolin will not so be streamed to a greater extent than about 30 feet in depth), will produce 8000*l.* value in tin ore, at a cost of production of from 4000*l.* to 5000*l.* The proprietary will, of course, observe that this result is expected to be obtained from removing and washing the kaolin to the limited depth mentioned, off the top part of the mass in only one pertenencia. When this upper floor of kaolin shall have been streamed off, a second or lower floor will then be streamed, and to stream which will only require a fresh adit at a lower level, and the deeper the workings in the kaolin below these floors the richer is the yield expected to be. The same adits will enable the company to extend the workings into the other pertenencias of this group; these operations will be better understood by a reference to the plan which accompanies this report.

The groups of mines (kaolin) called San Francisco, Santa Matilde, El Rosario, and La Amalia, several operations have been executed to test the richness and value of these mines, and the result has been very satisfactory. Regular operations have been planned, and already commenced on a small scale at these mines.

As respects the groups of mines (quartz) called Aurora, Tojalino, Estrella, and Carmen, they have not been deemed advisable as yet to expend the amount which would be required to open up these mines, but old workings have been cleared out, and such other operations executed as were necessary to enable a judgment to be formed of their value. Your directors are advised that the company have in these quartz mines a valuable property, though less certain, perhaps, in returns than the kaolin mines.

By various cross cuttings and openings, especially with the view to test the value of the property; in one instance, he selected a block of kaolin weighing 30 tons, which he considered a fair average of the mass, and with especial care, mechanically, extracted from it all the tin ore it contained, and it is satisfactory to state that at every point at which he had tried the kaolin for its yield of tin the estimates originally formed and submitted in the prospectus have been confirmed.

In addition to the smelting-works (which are very complete on a small scale) and other buildings acquired under the lease from Senor Merelles, a manager's house, store-house, workmen's houses, blacksmith and carpenter's shops, &c., have been built, or are in course of erection, at San Miguel, on a very economical scale, and other minor works, have been effected there. An overseer's house is also being built at San Francisco. The men sent out from Cornwall to lead the natives have conducted themselves with much propriety, and have been of great service to the company. The supply of native labour is abundant, on moderate terms, and the field to be operated upon seems, as the mining manager has stated, to be unlimited.

The proprietary will observe that, although extensive preliminary operations have already been projected and prosecuted at the mines, the expenditure of the money has been very limited, as shown by the annexed account; the operations required to be carried on are of such a nature as not to require a large amount of capital to develope the mines even on a very extensive scale.

Your directors have only to add, that in their judgment the property possessed by the company is a very valuable one, and will yield at an early date a liberal return for the capital now being expended upon it.

The plans, reports, &c., relating to the operations of the mines are open to the inspection of the proprietary at the office of the company.

The books and accounts of the company have been examined and audited, and certified to be correct.

The directors who retire, in accordance with the Articles of Association, at the ensuing annual general meeting of the company, are John Huish, Esq., Senor Don D. A. Merelles, and William Richardson, Esq., and being eligible they offer themselves for re-election. Henry Croysdill, Esq., is the auditor who retires on the present occasion, and being eligible he offers himself for re-election.

The share transfer books of the company will be closed from Thursday the 1st, until Tuesday the 13th day of May, instant.

RECEIPTS AND LIABILITIES.

Share capital—17,000 A shares, at 7s. 6d. per share	£6375	0	0		
3,000 B shares, at 1*l.* per share	3000	0	0		
20,000 shares.	£9375	0	0		
Less—Deposits on shares allotted but not paid at this date..	1881	0	0		
Deposit on 1000 shares reserved for arrangement with mining manager, at 7s. 6d. per share	375	0	0	£7119	0 0
Interest received on capital				27	10 2
Transfer fees received				0	7 6
Exchange				4	17 11
Bills payable				580	0 0
Balance due on open accounts				77	15 2
Total				£7809	10 9

PAYMENTS AND ASSETS.

Price paid for perpetual lease of mines, &c., in 31 pertenencias				£4000	0 0
Paid fees, &c., for grant of four-additional pertenencias from the Spanish Government				10	15 5
Paid for tools, implements, stores, &c., sent out to the mines				224	1 3
Buildings, store-houses, and tramways, &c.				139	11 6½
Advertising				141	6 2
Printing prospectuses and Articles of Association, &c.				61	0 2
Engraving seal, lithographing plans, &c.				16	5 0
Brokerage on shares				125	0 0
Commission on the advances made by the company' agents at Vigo				3	12 11
Solicitors' account for drawing deeds, &c., and including fees for registering the company				80	0 0
Incidental expenses, including passages to Spain of mining manager and miners, travelling expenses, translations of deeds, and postage of prospectuses, packets, &c.				220	12 10
Postages paid in England and Spain				21	14 4
Stationery, books, &c., London office	£49	5	11		
Ditto ditto Spanish office	13	1	7½	62	7 6½
Rent paid to Senor Domingo Antonio Merelles for the mines, from the 1st of September, 1861, to 31st March, 1862				729	3 4
Balances on open accounts				8	8 5
Wages to Cornish miners				159	4 8
Ditto to native miners				317	6 6
Venturerors, paid them for 9351½ Galician lbs. of tin ore				99	9 11
Government "contributions"				19	10 10
Mining manager's salary to account				222	18 9
Office rent, clerks' salary, &c., to 20th March, 1862				108	6 8
Secretary salary to ditto				206	13 4
Cash in hand in Spain	£ 61	15	2		
Cash on deposit at interest	500	0	0		
Cash at bankers' current account	256	18	7		
Cash in hand in London	13	6	11=	832	0 8
Total				£7809	10 9

THE CHAIRMAN, in moving the adoption of the report and accounts, said it was about a year since the shares of this company were distributed, but for two or three months after that time a little difficulty was experienced in finding a proper person to go to Spain, and lay out and open up the company's mineral lands and start operations, with a view to efficiently develope the company's property. In August, however, they met with Mr. Gunther, who was a gentleman very well known in the mining world as an experienced, scientific, and practical miner. Mr. Gunther took the management for six months; he had, however, since agreed to remain till the end of June, at all events. Mr. Gunther arrived at the seat of operations on Oct. 3, whereupon he immediately set to work—the directors having previously arranged that some Cornish miners and mechanics should follow him by the next steamer. Since that time a great deal of work had been done—not mining in one sense, although preparatory to actual mining. Proprietors were aware that the operations at a tin-streaming mine were different from those pursued in mining generally. They did not have to quarry the hard rock, and trace the veins of ore through the rock, but, as stated in the report, the over-burden, or surface earth, was removed, and the tin-bearing kaolin, or china-clay, became exposed. An abundant supply of water was then brought by leats to the top of the kaolin, or tin-bearing clay, and as it flowed down over the mass a portion of it was continuously being carried to its base, where the tin ore was extracted by machinery and appliances of the most approved construction. But it was obvious that to carry on such operations there must be an outlet for the water, for unless they had an adit, or drain, by which the water could be carried away, tin-streaming could not be carried on. Therefore, their actual operations had been for some time delayed in preparing this necessary adit, in laying down a tramway, and in removing the overburden, or uncovering the kaolin, and all that had been done up to the present time in the way of getting tin was from just such portions of the clay as had been removed in making cross-cuts to test the value of the mine, and in receiving tin ore taken out by ventureros. In doing this alone, without making it their object to look for tin, they had secured about 10 or 12 tons of rich ore, which was valued at something like 600*l.*, and which value, as the ore was still in store, had not been brought to credit in the accounts. He then read extracts from letters received from Mr. Gunther, all of which went to show that he entertained a favourable opinion of the property. Speaking, in one of his early reports, of the properties of the company generally, Mr. Gunther says—"From all I have seen, I have come to the conclusion that the property is a first-rate one, monopolising, as it does, a whole extensive range of mountains—the Pertenencias—securing, as it were, the cream of all the mineral deposits of the district, and being so placed as to exclude the possibility of competition on the part of other parties. In addition to the great number you have got, the variety of deposits—tin in immense bands of kaolin, and tin in very rich quartz lodes (at one, Pertenencia Toldjino, for example, they took out a whole flake of solid tin ore several feet long), not to mention the alluvious, which have never been opened. The property is capable of being developed to a most gigantic extent. In planning the necessary preliminary operations, I shall take the utmost care to do it in such a manner as in no case to interfere with any future operations on a large scale." In addition to the mineral already mentioned, the property contained arsenical ore in large quantities—this ore might prove an outside source from which profits could be realised. Specimens had been sent home, and upon assay they were proved to contain 63 per cent. of arsenious acid—it was, in fact, an arsenical pyrites, which might prove to be of some considerable value, the more especially as it contained silver. Although by far the greater portion of the company's property consisted of groups of tin-bearing kaolin mines, yet they had seven pertenencias containing quartz lodes yielding tin, which might prove to be of great value. So far as their operations had gone generally, the directors considered everything presented a most favourable appearance, and they believed they had really secured a very valuable property upon moderate terms. It might, perhaps, be naturally asked, how came such a property to be disposed of? the answer to which was easily and satisfactorily given. It was that the rude operations of the ventureros had rendered much more skilful and extended operations, as well as the outlay of money necessary, in order to produce immediate large returns. By the system which Senor Merelles adopted, the ground was never explored deeper than 30 feet, and yet they produced a handsome income, after paying the costs of the mine; consequently, it was but natural to conclude that when a regular and effective system was carried out that considerably large returns would be made, and proportionate profits realised. From all the board had been able to learn with regard to Mr. Gunther, they believed him to be a man of extensive knowledge, and that it was his nature not to overstate, but rather to understate his opinion, and not to hold out hopes that could not be realised—the board felt that to be the case, but whether the shareholders were generally aware of the fact he did not know. The board had had some difficulty in obtaining from Mr. Gunther a speculative opinion—it he might so call it—as to the degree of profitable result with which the prosecution of the mine could be carried out; Mr. Gunther's answer being that he was anxious to state facts rather than to express a speculative opinion. The whole of their operations had been prosecuted with the greatest caution, so that the mine might be thoroughly tested before any large expenditure was made. Up to the present time a great deal had been done in the way of proving the property, and they would be prepared to commence pretty extensively in about three or four months their streaming operations—upon such a scale, probably, as to enable them to get several thousand pounds of profit from tin ore. The directors were all most anxious for the success of the company, as an evidence of which he might state that they had not taken credit for any salary for their services up to the present time. Of course, when the mine was brought into a profitable state of working the directors would accept a reasonable allowance. Before concluding his remarks, he might state that the 600*l.* worth of tin ore not included in the account, of course formed an asset of the company.

A SHAREHOLDER enquired what amount had been expended up to the present time?

The CHAIRMAN replied that they had paid 1000*l.* in cash, and 3000*l.* in shares, not to receive a dividend until the 17,000 A shares had received 10 per cent. in any one year, when the 3000 or B shares would receive 10 per cent. also; and that about 1000*l.* had been expended in paying for implements, stores, and labour at the mines.

The SECRETARY, in answer to a question, stated that about 300*l.* had been expended since the date of the account on the 31st of March last.

A SHAREHOLDER enquired if the directors had a manager in view to succeed Mr. Gunther?—The CHAIRMAN replied, that the directors had been for the last two months negociating for the selection of a new manager, and at length had chosen one who was a thoroughly practical tin miner, and understood the Spanish language—Capt. Bray, who would leave in about a fortnight or three weeks. There was no apprehension that the ideas of Mr. Gunther and Capt. Bray as to the works that ought to be prosecuted would be different, inasmuch as Capt. Bray perfectly coincided with all that had been done, as also with the system of operations proposed to be adopted.

The report and accounts were then unanimously received and adopted.

The CHAIRMAN, referring to the financial position of the company, said the directors hoped that they might not have to make another call, for they still had in hand upwards of 2000*l.*, and including the value of the tin ore, they might say 2500*l.* But, at the same time, the directors could not pledge themselves that no further call would be made.

The retiring directors were re-elected, and the auditor re-appointed, when a cordial vote of thanks to the Chairman and directors terminated the proceedings.

MINING IN AUSTRALASIA—MONTHLY SUMMARY.

MELBOURNE, MARCH 26.—We have still to report large reductions in the quantity of gold brought down by escort—the total quantity received up to this period, representing nearly a quarter of the year, is 357,744 ozs. as against 433,956 ozs. of gold for the corresponding time of last year. With a continuance of a proportionate deficiency till the close of the year, the gross yield of the Victorian gold fields will not reach 7,000,000*l.*—a sad falling off, when we consider that with a third of the population in 1852 the gross yield exceeded 17,000,000*l.* The falling off this year has been materially increased through the rush of so large a body of our best miners having gone over to New Zealand, the number registered as having sailed from this port being 22,120. It is expected, now that the New Zealand winter is approaching, that many miners will return, to escape the inclemency of the season, and that we may probably look forward to better returns during our wet season.

The intelligence from Inglewood is much more favourable, although several crushing-mills are idle for want of water, notwithstanding prospecting is persevered with, and three new reefs have been proved payable. One of the best crushings reported in this district is from a prospecting claim on Leicester's Reef, 21 tons of stone having yielded 48 ozs. 15 dwts. of gold. Mount Korong has again yielded some very handsome nuggets from abandoned ground. One party found a nugget weighing 7 lbs., and another party of miners in some old workings came across a nest of seven nuggets, in the aggregate no less than 32 lbs. The reefs in Bowman Forest have improved so much of late that crushing machinery is about to be erected upon the spot. At present the quartz has to be carted from 7 to 8 miles to Myrtleford, and this does not answer, although some of it returns from 2 to 3 ozs. to the ton. At Ballarat many of the large mining companies which we have so often noticed working on the famous deep leads of Golden Point, Inkermann, Redan, and Frenchman's continue a course of unvarying prosperity, the dividends ranging from 15*l.* to 50*l.* per share per week. About a fortnight since a nugget, weighing 320 ozs. was found by the Koh-i-noor Company, and about the same time the Great Extended Company realised 2460 ozs. for a fortnight's work. A new rush has taken place to a locality known as the Bull-dog Creek, Rokuwood, and a considerable number of miners are profitably employed. The sinking is about 50 ft., and the wash-dirt is principally found in fissures and cracks. The mining population of the Maryborough district are doing tolerably well. The diggings extend over a large area of country, and comprise gold working of almost every description. The new diggings at Sago Hill are turning out well, some of the holes bottomed being apparently very rich, although here, as well as in other places, the want of water is a great hindrance. The finding of rich stone in different claims on the Pyrenees Reef has caused considerable excitement at Red Bank. Many of the abandoned shafts have been taken possession of again, and when the water level is reached, pumping-gear is to be erected to drain the reef, to allow of deeper sinking. Several of the alluvial miners at Donkey Hill, Moonambel, are doing moderately well.

The Land Question, which has unsettled the public and so many Governments for so many years, is now virtually settled, and the following are its principles:—10,000,000 acres of land are to be surveyed, from which the public will be allowed to select farms of not exceeding 640 acres, in any one year. Of this, 4,000,000 acres are to be ready for selection on the passing of the Bill, and to remain open for three years, and each succeeding year 2,000,000 acres of fresh land are to be open for selection for a like period, so that in four years the whole of the 10,000,000 acres will have come before the public, while at the expiration of each succeeding period of three years that portion of each year's survey not selected reverts back to the Government, *alias* "Squatter," so that in seven years from this day free selection ceases, and land can only be obtained by auction in competition with the Squatter. The price to be paid to the Government is 1*l.* per acre down for one-half the block selected, and 2s. 6d. per acre for the other half in eight yearly instalments. For this concession the holders of squatting stations, comprising an area of 25,000,000 acres, are to be allowed to retain them for 10 years, at a nominal rental of 10*l.* per year for a station, some of them comprising an area of 300,000 acres, and a small assessment per head on sheep and cattle, besides the whole of the 10,000,000 acres of surveyed land, until it is taken up for agriculture. As it has taken a period of 25 years to bring 400,000 acres of land under cultivation, the squatter knows well that in the next seven years but a small proportion of the 10,000,000 acres can be taken from him; hence he retains possession of almost the whole country for a mere song.

The following is an extract of a private letter from Sydney, dated March 19:—"Don't sell or let any Sydney property until we know more of the Lachlan diggings, for it is now almost proved that they are the richest ever yet seen. Last week the escort brought down 11,500 ozs., and left 5,000 ozs. behind."

The *Sydney Herald* announces the discovery of a silver mine at the River Moruya, about 200 miles south of Sydney. Copper was discovered at Orange, New South Wales, some time ago, and the *Herald* "hopes to be able to report the first shipment of metallic copper in its next summary." —— C. LEICESTER, M.E.

ADELAIDE.—The price fixed by the South Australian Mining Association for Copper is 93*l.* 10s. per ton at Port Adelaide, being a reduction of 3*l.* per ton on last month's rate. The market is overstocked with all kinds of metals, and prices are unprecedently low. There have been numerous arrivals of Coal from Newcastle, New South Wales, during the last few days, amounting in the aggregate to 3400 tons, and prices are likely to be somewhat affected.

The *South Australian Register* of March 26 says:—"Messrs. Hughes and Co.'s Wallaroo and Moonta Mines, on Yorke's Peninsula, are turning out large quantities of ore, and the Cornwall Mining Company's claims are becoming very productive. The Bremer Mine, in the Mount Barker District, is also looking well. Some of the new discoveries in the North are said to show large quantics of surface ore; but we are not in a position to give any special information respecting them. The Burra Burra and Kapunda Mines are working as usual. At the former, however, the number of hands has been considerably reduced, in consequence of the large demand for mining labour at Wallaroo, and from the determination of the directors to dispense with all unnecessary expenditure. We hope by the end of the year the export of copper and copper ore will show a large increase upon that of any prevous year in the history of the colony."

"The supply of gold is smaller this year than during any year since 1852. It is only 357,744 ozs. to the present time, against 433,956 ozs. last year; hence, we can scarcely calculate on more than 1,500,040 ozs. for the year, unless some unusual discovery should take place. This is not half the quantity of the best years; but while the supply has been falling off here, it has been increasing in New South Wales and New Zealand. The yield in New South Wales in the first two months of 1861 and 1862 was as follows:—

	1861.	1862.
Western escorts	21,934	30,113
Southern escorts	26,816	47,132
Northern escorts	6,032=54,782	5,215=82,460

This, without any continuing increase, will give 494,760 ozs. for the year. Further on I shall show that the quantity which may be expected from New Zealand during the year may be estimated at 561,511 ozs. These several sources of supply may, therefore, confidently be expected to yield as follows, and if the Lachlan gold fields come up to the expectations of the Sydney press, the grand total will probably be greater:—

Victoria	1,500,000 ozs., at 80s. 0d.,		£6,000,000
New South Wales	494,760	„ 77s. 6d.,	1,917,195
New Zealand	561,511	„ 77s. 6d.,	2,175,874=£10,093,069

The other colonies are organising prospecting parties and offering high rewards for the discovery of gold. The Government of Tasmania offers 20,000*l.* reward for the discovery of "a paying gold field;" Western Australia offers 5,000*l.*; and several of the provinces of New Zealand make similar offers."

The correspondent of the *Times* writes—"Not very much has been done at the reefs lately, for the reason stated; still there have been a few large yields, but mostly from small parcels of quartz. Thus 1½ ton from the Arcadian Reef, Inkermann, produced 233 ozs.; and from 1 ton out of the Pyrenees Reef, near Red Bank, the yield was 201 ozs. 7 dwts. Very rich veins of stone have been struck in different claims on this reef within the last few weeks, and from a former crushing of 5 tons over 300 ozs. were obtained. The best yield for some time past from any of the Inglewood Reefs was in the shape of a cake of amalgamated gold, weighing 569 ozs. 5 dwts., the produce of 140 tons of stone out of one of the claims on Maxwell's Reef; the two next best being 92 ozs. 12 dwts. from 21 tons out of the New Jersey Reef, and 56 ozs. 17 dwts. from 15 tons out of the Odin Reef. The Bendigo district also has furnished its proportion of good yields, a lot of 6¼ tons from one reef producing 153 ozs. 3 dwts.; another of 42 tons from a different reef, 154 ozs. 18 dwts.; and a third of 13 tons 77 ozs. 13 dwts. Two tons from Iron's Reef also produced 30 ozs. 15 dwts. 12 grs. Only one large yield has been announced lately from the Castlemain district, and that was 133 ozs. from 15 tons of stone out of the Nimrod Reef. Two or three of the Ballarat companies have been in Fortune's way lately, and their dividends have been proportionately large. Thus the Great Extended washed out during one fortnight 2460 ozs. of gold, and allotted 100*l.* to each shareholder for that time, clear of all expenses; and the Koh-i-noor Company, with half the number of men, washed out 887 ozs. in one week, a nugget of 320 ozs.—the largest found here for some time past—being a part of this. This same company found another nugget, of 63 ozs., last Saturday, and had a dividend of 110*l.* per man for the two weeks ending with that day. In regard to nuggets we have nothing else worthy of special announcement, as the number is small, and the total weight of the whole would not be equal to that of the first above-mentioned."

AUSTRALIAN MINES.

KAPUNDA.—The January ores were 292 tons of 14¼ per cent., average produce equal to about 42 tons of pure copper; and the yield for Feb. was estimated at 200 tons of somewhat higher per centage than recently reported. The quantity of copper made in Feb. was 50 tons, and the shipments since the last advices are further 11 tons per *Luisa*, making 73½ tons in that vessel, 9¼ tons per *Venilia*, and 42 tons in course of shipment, per *Northern Light*, all direct to London. The copper roaster and refinery had been under repair. Fuel was coming in steadily, sufficient to prevent the stock being much reduced before the wet weather.

GREAT NORTHERN COPPER.—Mr. Bonney, the superintendent in Adelaide, states—"Capt. Morrison having given a detailed report upon the company's mines, it is unnecessary for me to go over the same ground; more especially, as a report coming from a gentleman professionally acquainted with mining operations must necessarily have more weight than anything I could say." Capt. Morrison's report—Mine No. 7: I found the men sinking the present whim-shaft, which I find is off the lode, it having taken a turn to the eastward under very great difficulties, the water being so quick that they were only able to work one-half of the time. I also visited the various sections on the westward side of the property, and found them all containing at a shallow depth, and all over the surface, innumerable small bunches of ore, consisting of the green and blue carbonates, but not at all settled. Mines Nos. 9 and 11 I found looking far more favourable, and quite a change of ground, it being more settled; the lode is visible, and can be traced through both sections, containing some very fine specimens of red oxide, and it is here, I think, the body of ore will be found. The eastern mines and also the Mount Chambers Mine are exactly of the same character as Nos. 9 and 11, and by the erection of an engine and sinking some 40 fms. or more, the result will prove favourable.—Mount Stuart Mine: A very fine and promising lode visible on surface, averaging some 7 to 8 feet in width; a shaft has been sunk some 20 feet from the lode, so as to strike at the 20 fm. level, but has been discontinued; in going down they met with some small branches underlying east, apparently coming into the main lode in depth.—Two Brothers: Very little, if any, work has been done here; the lode is quite traceable the whole length of the section, showing some very rich stones of ore, but apparently very much pinched, and greatly mixed up with iron.—Nuccaleena Mine: We are breaking some very rich ore in the back of adit level No. 1; also in the winze, which is holed to the deep adit level."

NORTH RHINE COPPER.—You will see by Capt. Barkla's report that the sinking of Cope's engine-shaft to the 60 fm. level has been proceeded with with all possible dispatch, and that that depth will be reached by the end of the present month, when he will at once commence driving north and south at that level, and expect to cut the main lode by the end of April, when we trust such discoveries may be made as may tend to render the future prospects of the mine encouraging.

WORTHING.—Cost-sheet for the month, 1464*l.* 4s. 2d.; ore raised in the same period, 150 tons, of the usual quality; regulus shipped by the *Venilia*, 88 tons

of 52 per cent., valued at 4100*l.*; draft drawn against same, 3500*l.*; regulus left at the port ready for shipment, 40 tons of like percentage; ore ready dressed at the mine, 70 tons, besides a vast quantity of dredge ore; wood in stock, 3000 tons, and large quantities coming in. Smelting works going on well. The mine never looked better, especially in the 33 fm. level, where there is a fine course of ore, which by stripping the sides of the level has been found to be from 4 ft. to 3 fms. wide.

WHEAL ELLEN.—The 30, north of Scott's shaft, has been driven as far as it is at present necessary, and the men put to rise in the back of the level, to communicate with Squarey's engine-shaft. The lode there is large, and principally composed of mundic, with a leader on the footwall of jack and galena, varying from 2 to 6 inches wide. Squarey's engine-shaft is being pushed on as fast as possible; two pares of men are employed; one pare of eight men are sinking from surface, and another of six men rising from underground to meet them.—Pitch on Copper at Spence's Shaft: The lode in the back of the 30, south of the shaft, varies from 11 in. to 1 ft. wide, of black oxide and a little mundic; the tributers have weighed off 11 tons of ore, and are getting another parcel ready. An intermediate level has been driven north of the shaft, at the depth of 26 fms., where the lode is 6 in. wide, of black oxide, which has justified our putting four men to drive north at a deeper point, where the lode is larger, composed of mundic, and spotted throughout with copper; we hope by driving this level to open up productive ground. At surface the new calcining furnace has been completed, and set to work calcining dressed galena and carbonate ores. The blast-furnace is being rebuilt according to Mr. Goundry's designs. There are at present 36 men on the mine.—[We shall publish Messrs. Jenkin and Son's report on Wheal Ellen in next week's Journal.]

PORT PHILLIP AND COLONIAL GOLD.—During Feb. the quantity of quartz crushed was 2470 tons, which yielded 1255 ozs. 7 dwts. 12 grs. of gold, being an average of 10 dwts. 4 grs. per ton. The receipts on Clunes account were 2164*l.* 5*s.* 6d.; payments, 1894*l.* 6*s.* 5d.; profit, 269*l.* 19*s.* 1d. The total outlay per ton of ore crushed was thus 15*s.* 4d.; the expenditure, however, includes 267*l.* calcining and delivering quartz; 230*l.* addition to stock of firewood; and 300*l.* for a steam-engine; amounting together to 797*l.*, deducting which the outlay per ton is 8*s.* 10½d. The quantity of quartz crushed in Feb. shows an increase on the Jan. return, but is rather under the general average. This is caused mainly by occasional stoppages of the machinery through short supply of quartz. The profit for the month is small, and has been so since Nov., owing to two causes—extra expenditure and diminished yield, and in both these respects I expect we shall after this month show an improvement.—Machinery: This is all in good working order, and the stone-breaking machine has been got to work, and I trust will prove a saving on our present calcining process.—Clunes Mine: The main shaft is now down 374 ft.; sinking has been for the present discontinued, in consequence of the influx of water. The large pumps are being put down, and it will be a month before sinking can be resumed. A remittance of 1000*l.* has been received by this mail.

ENGLISH AND AUSTRALIAN COPPER.—The quantity of coal at Kooringa was 309 tons, and at the Port Works about 55 tons. Four vessels, with 1446 tons, were discharging, and two other ships with about 1000 tons more were expected daily. The number of furnaces at work at Koorings were four, and at the Port Works four; also one refinery was at work at each place. The whole of the company's operations were proceeding satisfactorily, and the horses and mules were doing their work well.

SCOTTISH AUSTRALIAN MINING COMPANY (Limited).—The Cadiangullong Mine continues to open up in a very satisfactory manner, as will be seen from the following report:—"Adit Shaft South Cross-cut: This working is now in a little over 50 ft., and looks well. The present yield of ore is estimated at 6 tons of 10 per cent. per fathom. The north cross-cut has been driven about 29 ft.; this, with 10 ft. in the shaft, and 50 feet in the south cross-cut, gives us a horizontal breadth of 89 feet. Simultaneously with the develop, we sunk a winze from the open stope to meet this working, at a depth of 3 fms., for the purpose of ventilating the mine, and which has realised our utmost expectations. We passed through in sinking this winze one of the finest floors of ore we have yet seen in the mine, of about 9 ft. in thickness, from which we have taken about 10 tons of 25 per cent. ore (unpicked). The east drive is in some 29 feet; in this end the lode is rich. We estimate its present yield at 8 tons of 18 per cent. ore per fm., and the total yield during the month of this and the two cross-cuts at (say) 35 tons of 10 to 12 per cent. ore. Murphy's shaft is down about 63 feet; the appearance of the lode has greatly improved since I last reported. The iron and gossan are now carrying small quantities of yellow pyrites of copper. Water shaft for engine has been sunk to a depth of 52 ft. 6 in. We are now driving a level in a northerly direction from this shaft, to communicate with the south cross-cut from the adit shaft. We do not anticipate being able to secure sufficient condensing water for the engine in this shaft, without bringing the water from the lode; this is the object of the level.—Engine-shaft: We have within the last fortnight commenced the sinking of an engine-shaft.—Stopes: We have in the stopes some seven or eight men. Three are engaged stoping on ore at 1*l.* per cubic fathom, and two others are engaged in stoping and wheeling to tip the overbourne, at 1*l.* per cubic fm. The yield of ore for the last month is estimated at 120 tons; 15 tons of from 40 to 45 per cent., and 105 tons of 15 per cent. I have again made no estimate of the low class ores. We have probably raised in the last two months 100 tons of 5 per cent. The machinery belonging to the engine has been delivered on the ground in good order. The site for the house has been pegged out, and we are proceeding with the cutting of the foundation. Mr. Morehead, the superintendent of the company, reports that the contractor has executed the task of conveying the engine and machinery from Sidney to the mine expeditiously and well, and that no time is being lost in making arrangements for its erection; also that Mr. Christoe is urging forward the completion of the smelting works as quickly as practicable. Mr. Morehead expresses much satisfaction at having secured the services of Capt. Josiah Holman, whom there is every reason to regard as an educated, experienced, first-class miner and mining agent, to be at the head of the mining affairs of the company. Capt. Holman had arrived in Sydney from New Zealand, and proceeded to the Cadiangullong Mine; and Mr. Morehead concludes his reference to the subject by remarking that he is much satisfied with all the persons at this mine holding appointments of a responsible character.—The Good Hope Mine: The machinery originally intended for the Good Hope Mine having been diverted to the Cadiangullong Mine, and further operations of an extensive character at the former without machinery not being practicable, future proceedings had not been determined. Mr. Morehead states—'I have not yet received from Mr. Christoe an assay of the Good Hope ore. He will soon be in a position to furnish us with the assay.'—The Colliery: The spot for the first main pit has been fixed, and instructions for the dispatch of the rails for the short branch line from the company's property to the Great Northern Railway have been received. It may be enough to quote the closing remark of Mr. Morehead's present communication upon this matter—'I conclude what I have to say under this head by observing that our prospects in connection therewith seem in all respects satisfactory.'"

BON ACCORD COPPER.—The Chairman of the committee at Adelaide reports that Whitford and his party of miners (until recently at the Burra Mines) are working in the Bon Accord in the locality where they lately suggested a trial ought to be made, and offered to make it; that is to say, to the west of all workings previously executed on that property, but without their having been long enough so employed to determine what was the probability of their ultimate success. The instructions sent to the committee of management at Adelaide by the directors, in March, to carry out certain other exploratory operations, as recommended by Captain Dalley on the Bon Accord property, to the east of all workings hitherto executed on the property, had not up to the date of the present dispatch been received or anticipated; but they would be acted upon when received, as they were positive in their terms, though the operations contemplated by such instructions were neither very extensive, nor of an expensive character. The Chairman of the committee states:—"I am still of opinion that it is at the lower levels where ore alone will be found, if it is in the property, of which I cannot bring myself to believe that there is a doubt. We have hitherto been most unfortunate in our attempts to discover it, but we have had many difficulties and discouragements to contend with; and much of the property is yet unexplored."

DUN MOUNTAIN COPPER.—Up to the present time about 270 tons of chrome ore have been deposited on the wharf, of which about 70 tons are already shipped. The mail steamer leaving for Sydney to-morrow will take about 65 tons, and by several other opportunities, including ships on the coast, we shall get away about 700 tons, which will make a considerable inroad upon the 2000 tons so long waiting transmission. You will observe from the engineer's report that the south-west copper lode still continues encouraging, the ore improving in character as the mining proceeds, but pending the report expected from Sydney upon the ton sent them by the last mail steamer we are unable to speak definitely of its actual value; in the meantime you will probably have received the ton of which which we advised you in our last, and be yourselves in a position to determine its worth for copper. Our present staff is calculated to bring down about 4000 tons per annum, which will, no doubt, be satisfactory to the London directors.

MINING IN SOUTH AUSTRALIA.

Soon after our arrival here we visited the Burra Burra district and mines superficially, the product of which is well known to the mining world; but taking the whole district, from Adelaide to Kapunda, where its mineral productions are fully and ably developed, it naturally led us to a close observation over our limited distance traversed. A great deal has been accomplished, which reflects the greatest credit on the different managers of these important undertakings. The district generally is highly metalliferous, and deserves the attention of capitalists.

Our next visit was to the Strathalbyn Mine, now idle. This promising adventure seems to be one of too many others similarly circumstanced, but with good management may yet do well.

The Wheal Ellen, which has been some time in operation, is effecting certain improvements, which we hope may be remunerative to the shareholders.

The Worthing Mine was next seen by us, which reflects the greatest possible credit on the indefatigable exertions of its manager, Mr. Alfred Hallett, and also that of the resident agent, Capt. T. Dean, whose practical experience as a mining engineer ought to be highly valued by this colony. The pumping-engine and other machinery are models of neatness. The cobbing, or crushing, machinery is a great success, superior to any yet seen by us. The dressing department is the best adapted of anything yet seen in the colony, and the only thing required of the company is time and patience; they will then have a mine second to none in the district.

The Kanmantoo Mine is also one of great promise; the whole district, in fact, is extremely rich in mineral wealth. Auriferous and argentiferous ores are to be seen in large quantities, but whether sufficiently rich to pay for working is yet to be ascertained. In the village of Hahndorf are to be seen some fine specimens of silver-lead ore, but, owing to some trifling disagreement between its proprietors, this is at present idle.

In the Glen Osmond Stone Quarry are to be seen two distinct branches of rich silvery-lead ore, which will yield on an average 30 cwts. of ore per fm., worth, at least, 15*l.* per ton. Is it not astonishing to see such a thing so fearfully neglected?

We may hereafter report upon the Wallaroo district. ALFRED JENKIN AND SON.
—*South Australian Register*.

STEAM-ENGINE AND BOILER.—Mr. Giffard, of Paris, has just specified, as a communication to Mr. Henry, patent agent, Fleet-street, an improved boiler and engine. The boiler is characterised by the employment of a reservoir of hot water and steam, consisting of a strong chamber, or water space, into which lead a number of sloping tubes, placed above the fire-bars of the furnace, and plugged at their outer ends. The engine consists of a pair of tubes, or narrow cylinders, in which work plungers connected at their outer ends by side-rods. The tubes are supplied with steam through a block, which closes their inner ends, and on the face of which works a slide-valve, balanced by a rod and spring. A supplementary link-motion is combined with the ordinary link-motion, so that the valve-rod is worked through the intervention of this extra link and its gear, which constitute what is termed by Mr. Giffard a "correcting apparatus. The combined engine, boiler, and valve-gear constitute a machine for producing and employing steam at very high pressures.

A NEW STEAM TRAVELLING CRANE.—Messrs. Ellis, of Salford, have just completed a steam travelling crane for the new battery works of the Government at Portsmouth. The crane (their own invention) is capable of lifting 20 tons with a pressure of 40 lbs. It is worked by two small cylinders, with a perpendicular tubular boiler, and has three motions—longitudinal, horizontal, and perpendicular, with a span of 54 feet. The engineer, who stands in front of the crane, has all its motion perfectly under his command, and can double its power with the utmost facility. A water tank and pump for supplying the boiler are also connected. The steam crane will do double the work of an ordinary 10-ton crane worked by six or eight men, and in half the time.

COPPER MINING ON LAKE SUPERIOR.

BOSTON, APRIL 18.—During February and March there was a fair market for Mining Shares. Without much excitement, there was a gradual rise in values until Feb. 28. The upward tendency was then checked by the dulness of ingot copper. The following were the cash prices of that metal at the respective dates:—Feb. 10, 27 c.; Feb. 20, 26¼ c.; Feb. 28, 26½ c.; March 10, 25 c.; March 20, 24 c.; March 31, 21½ c. From the latter date to this time the price has been without essential change. Consumers are waiting for the opening of the Lake navigation, believing that the necessities of the mining companies will compel the early sales of their products at low prices. A careful inspection, however, of the annual reports recently, or soon to be, published will show that the mining business has become permanently established, and that, with a very few exceptions, the companies are in excellent financial condition. The product of 1862 will probably exceed that of 1861. The costs will be decreased, and further additions be made to the list of paying mines. Large sales of ingot copper have been made this week at 21½ to 22 c., cash. The market price may now be considered as fairly established at 22 c.

CENTRAL MINING COMPANY.—The annual statement, to Dec. 31, shows the product was 204 tons rough, against 82 tons the previous year. The yield in refined was 79·1 per cent.: 92 tons have been sold at 19·39 c., nearly 5 tons at 28 c., 25 tons were on hand in New York, and balance of the product is still at the mine. The strictly available assets exceed the liabilities by about $32,238·94. The result of the year was entirely satisfactory to the stockholders. With some additional outlay for machinery and buildings, the means for which are in the treasury, the product can be largely increased.

COPPER FALLS MINING COMPANY.—The report for the year ending Dec. 31 says:—"Commencing in 1858, this company has been working upon an east and west deposit at Keweenaw Point, known as the "ash bed." It is analogous to the amygdaloidal deposit of Portage Lake, but not so productive. The great uniformity of the value of the vein stuff, although of low percentage, has encouraged the shareholders of this and the Phœnix Company to believe that the exploitation might, with a reasonable outlay, be made profitable. The result of 1861 has clearly demonstrated that the cost of refined copper has been but about 17 c. per lb., and that, accidents excepted, the costs can be considerably reduced during the current year. Total products for 1861 in ingot copper, 486,108 lbs.; sales, including value of copper on hand, $111,961 26 c.; cost, including every item at the mine and at Boston, 17 c. 2 mills. per lb., $83,797 68 c.; nett profit on production and other items of profit, $30,084 35 c.; balance of assets over liabilities, $40,492 47 c.

HANCOCK MINING COMPANY.—The report for the year ending Dec. 31 gives a statement of the progress of the company from April 1, 1861, a period of nine months. During eight months of this time the sixteen heads of stamps have been running during the day-time only. The regularity and richness now warrant the continuous working of the stamps night and day, the completion of a deep adit level, the addition of sixteen heads of stamps, and the building of a tramway or gravity road of 1430 ft. from the mouth of the adit to the stamp-mill. The balance of strictly available assets, $10,040 30 c., with the earnings of the current year, it is estimated will enable these improvements to be made without a call upon the shareholders. During the past season, with but seventeen miners, the product has been 132,619 lbs. rough, or 98,692 lbs. of ingot copper, of which 17 per cent. was from masses and barrel work, and 83 per cent. from the stamps. The stamp rock yielded 1·67 per cent., or 33 lbs. of ingot copper per ton.

ISLE ROYALE MINING COMPANY.—The annual report shows a balance of assets over liabilities of $32,642 73 c. on March 10. This gratifying result places the company on a firm basis. The total product for the year ending Feb. 1 was 737 tons rough copper (442 tons masses and barrel work, and the remainder stamp work).

FRANKLIN MINING COMPANY.—In the year ending Dec. 31 the production was 1,736,401 lbs., yielding 80 3-4 per cent. ingot, or 1,402,078 lbs. Sales, including 154,430 lbs., unsold, valued at 23 c., $279,109 06 c.; cost, $338 72 c. per ton of ingot (16·936 c. per lb.), $237,443 13 c.; nett profit, $2 08 c. per share: the balance of liabilities over assets is $17,480 80 c. With the exception of a hoisting-engine, to be added this year, the mine is now fully equipped, and gives promise of most satisfactory results.

MINESOTA MINING COMPANY.—The annual report for the year ending Dec. 31 shows the production for the year: mass copper, 2,402,226 lbs.; barrel work, 972,239 lbs.; and stamp work, 223,132 lbs.—yielding 72·94 per cent ingot, or 2,624,087 lbs. Sales, including estimate of quantity unsold, $571,314 59 c.; expenditures (mining cost, $308,263 29 c.), $401,291 39 c.; nett probable profit, $170,023 30 c.: surplus of assets over liabilities, estimated, $214,061 66 c.

PEWABIC MINING COMPANY.—The report for the year ending Dec. 31 gives every item of cost of production of copper, rendering it valuable to the whole mining interest. The following are some of the results for the year:—Total product, 2,225,268 lbs., yielding 80 per cent. ingot, or 1,800,066 lbs. Sales, including amount unsold Dec. 31, 1861, but most of which has been sold since at a price higher than the valuation, 22·63 c. per lb., average, $407,348 83 c.; cost, $328 69 c. per ton of ingot (16·4 c. per lb.), 295,832 87 c.: nett profits, $5·58 per share. During the year an engine of 250 horse-power has been added, which, with the engine-house, has cost about $34,000. The machinery for stamping was run without cessation through the entire year. It is understood that no considerable outlay for the mining plant will be needed for several years. The report shows much improvement over former years in the several departments, and exhibits an intelligent appreciation of the necessity of rigid economy. The balance of assets over liabilities is $72·149 81 c. No account is made of a very large amount of stamp work accumulated on the surface.

QUINCY MINING COMPANY.—The annual statement to Jan. 1 shows an excess of assets over liabilities, estimating copper on hand at 26 c., amounting to $77,313 90 c.

ROCKLAND MINING COMPANY.—The report for the year ending Dec. shows the production for the year: mass copper, 491,313 lbs.; barrel work, 230,602 lbs.; stamp work, 203,526 lbs.—yielding 73·31 per cent. ingot, 679,089 lbs. Sales, including copper on hand, $142,656 25 c.; expenditure (mining cost, $127,333 42 c.), $149,357 35 c.: the deficit for the year was $6701 10 c., but the surplus over liabilities is estimated at $36,454 44 c.

Products of rough copper, in tons, in Jan. and Feb., 1862: Central, 60; Copper Falls, 36; Franklin, 137: Hancock, 13; Huron, 24; Isle Royale, 100; Minesota, 244; National, 141; Pewabic, 95; Pittsburg and Boston, 231; Quincey, 173; Rockland, 50; Superior, 11½ (mainly from accumulated stamp work).

Closing quotations: Central, $8 50 c.; Copper Falls, $7; Franklin, $20 87 c.; Hancock, $4; Isle Royale, $12 37 c.; Mesnard, $3; Minesota, $54; National, $31; North Cliff, $1; Petherick, $3; Pewabic, $25; Pittsburgh and Boston, $43; Pontiac, $1 37 c.; Quincy, $41; Rockland, $12; Superior, $2 50 c.; Toltec, $2 25 c.—DUPEE, BECK, AND SAYLES.

ON THE RELATIVE MERITS OF SKIPS AND MAN-ENGINES FOR RAISING AND LOWERING LABOURERS IN MINES.

[Transactions of the Miners' Association of Cornwall and Devon.]

The labour and fatigue of ascending by ladders from our deep mines is so very great, that it is now generally admitted that some machinery ought to be employed for lowering and raising the underground workmen. Considerable difference of opinion, however, seems to exist as to the best kind of machinery to be used for this purpose; some persons advocating the use of the "skip," on the same principle as that employed for drawing ores, &c., and others preferring the machine known by the name of the "man-engine," several of which machines have already been erected in this county. I beg, therefore, to offer a few remarks on what appears to me to be the relative merits of these two methods.

I suppose it may be taken for granted that proprietors of mines would not generally be willing to incur the expense of erecting machinery of this description in a very *shallow mine*, nor in a mine where only a *few persons* are employed. The subject will now be considered, therefore, in reference to a tolerably deep and extensive mine, and it should be remembered, further, that we now refer only to Cornish and Devon mines, with our present kinds of shafts and general mode of working. Keeping these points in view, I think it can be shown that the advantage in every respect is greatly in favour of the "man-engine."

We may consider the matter in three points of view—TIME, COST, and SAFETY.

1. As to the TIME required to raise and lower a certain number of workmen at the "change of corps," suppose that in a mine 200 fms. deep 100 persons had to be brought up, and another 100 sent down. The rod of the man-engine could easily be worked at the rate of five strokes per minute; and the length of the stroke is generally 12 ft.; so that a man could ascend at the rate of 10 fms. a minute, or 200 fms. in 20 minutes. By the time the first man who started from the bottom had reached the surface the other 99 persons would all be on the various platforms of the machine (there being a platform on the rod at every 12 feet), so that in 20 minutes more, or 40 minutes altogether, the whole of the 100 would reach the surface. The other 100 would descend at the same time, and thus in 40 minutes 100 men could be drawn up from the mine, and another 100 sent down to supply their places.

The "skip" as worked in the shafts of this county might, perhaps, contain *three* persons, or, at the utmost, *four*. Considering the time that would be required for four men to get into the skip at surface and step out at the bottom of the mine, and four others to step in at the bottom and get out again at the surface—with all the machinery in the best order, and with the greatest speed that could be made, it would probably require seven or eight minutes to send the skip to a depth of 200 fms., and draw it again to surface—say, seven and a half minutes, or eight skips per hour. Now, supposing that no interruption whatever took place in this rapid working, it would even then require upwards of *three hours* to draw up and send down 100 men, or more than *four times as long* by the "skip" as by the "man-engine."

In the above example I have only calculated for a man-engine with a *single* rod, and a *single* skip-road; but if two rods were to be used for a man-engine, and a double road for working two skips, the results would be about the same.

2. COST OF WORKING.—The cost of raising 100 men from a deep mine will, I think, be very much less by the man-engine than by the skip, and the reason of this appears to be very evident. In the man-engine the rod can be very nearly balanced by means of balance-bobs; so that with the exception of friction, &c., the engine will not have much more weight to lift than the actual weight of the men—whereas in the other case the engine has to raise the weight of the skip and rope in addition to the men. It is well known that on this same principle a certain number of tons of water can be raised from a mine by means of a pumping-engine for at least a quarter part of the expense that would be required to raise the same *weight* of ores by the most approved mode of drawing. The quantity of coals consumed for working the man-engine would probably be about the same *per hour* as for working the skip; so that allowing for the extra length of time, as stated above, the cost of coals for raising 100 men would be about *four times as much* by the "skip" as by the "man-engine."

3. SAFETY.—In this particular it appears to me that the man-engine has also a very great advantage. The skip is liable to many accidents, in either of which the effects might be most disastrous. For instance, the rod on which the skip is worked might be suddenly broken or removed out of its proper position, in which case, with the rapid motion of the skip, the persons in it would be in the greatest danger. Or the rope might break in the midst of working; and even if the safety-catch (which is now sometimes used) should prevent the skip from falling down the shaft, the rope, if it broke at some distance above, would, of course, fall upon the skip, which might cause serious injury; or if the engineman happened to be inattentive to his duty the skip might be drawn over the pully at the top of the shaft, as has sometimes been the case in the coal mines. In short, by the use of the "skip" for raising and lowering miners there is constant danger of accident from various sources. In the "man-engine," however, on the contrary, there is but little danger. Strong catches can be placed in different parts of the shaft, so that if the main-rod should happen to break it would only fall a few inches further than its proper position; and no one who was holding fast to the staple, which is fixed on the rod at every platform for that purpose, would be likely to be injured in the least. If, however, a man should fall from the rod he would only be likely to fall a few feet, as the shaft (when a single rod is used) can be closely covered at every 12 ft., excepting a small hole, just large enough for a man to pass through. And again, no accident need happen on account of the care'essness or inattention of the engine-driver, for, however, rapidly the engine might be worked, the men who were ascending or descending could remain on the *fixed* platforms without sustaining any injury. The man-engine with the *single rod* is undoubtedly attended with the least amount of danger, as the shaft can then be covered at every 12 ft.; but if the additional time that would be required in ascending is to be a matter of much importance, then a man-engine with *two rods* can be used, which is then, in my opinion, far more safe than the skip.

Whether, therefore, we considered the time required for raising and lowering a certain number of men, the cost of raising them, or the safety of the persons concerned, it seems to me that the advantage in every respect is very greatly in favour of the "man-engine."

Dolcoath Mine, Camborne. JOSIAH THOMAS.

MR. LOAM said the man-engine had been an object of deep interest to him ever since the question was first brought out. The object of drawing kibbles and skips with men in them, instead of by a man-engine, had also been thoroughly gone into, and had resulted in favour of the man-engine as at present constituted, with two rods instead of one. If you have 20 or 30 different points of discharge the men can discharge themselves by the man-engine without stopping it, but that cannot be done with the skip. Supposing the rope stretches, the engineman, guided by his indicator in the engine-room, stops the kibble at the supposed point of discharge, but in reality it is 3 or 4, or 5 or 6 ft. too low in the shaft, this would be of serious consequence to the men in the kibble. He saw no ground for preference of the skip over the man-engine; indeed, the skip was fraught with very great danger, and unless such things were thoroughly discussed, and this danger could be lessened by further discovery, adventurers should set their faces against experiments involving risk to the lives of men, and take steps to prevent them.

MR. GRYLLS remarked that a case occurred on Saturday in a neighbouring mine. Some men, contrary to orders, and with a penalty hanging over their heads, jumped into the skip as it passed a level, and were soon on their way to surface. It happened that a very stupid lander was at the shaft, and in sending down some sail it had caught in one of the sleepers, and 5 cwts.—taken out of the descending skip—was suspended in the shaft. The ascending skip caught this iron on its upward journey, and the iron formed a complete arch over the top of the cage. At grass they could not think how the skip came up so slowly, and with such a series of jerks. At last the imprisoned men were heard in the shaft calling out "Murder!" The engine was stopped: the kibble-lander went down 30 fms. by the rod itself, and found the poor fellows caged. Besides all their fright the men had to pay a sovereign each.

Capt. TONKIN had watched the records of accidents in the newspapers, and believed that were one man was lost in Cornwall by the man-engine 50 were lost in the collieries by the skip. No accident had happened in this district, except through carelessness.

MR. GRYLLS said three had happened in the United Mines, but entirely through carelessness. On one occasion 50 men were on the rod when a breakage occurred. The plunger was working in water, and they were let down so easily that no serious occurred.

MR. A. PAULL said a captain lost his life recently in Levant Mine, while on the rods, but it was thought to be caused by a sudden illness.

MR. TWITE: Certainly not from any defect in the man-engine. Mr. Twite added that he had a few words to say on the question of winding. In a paper he had read at Redruth [see *Mining Journal* of January 8] he endeavoured to impress upon the members of that Association the propriety of furnishing correct information as to the cost of winding, and the systems in use in different mines. He had now some particulars of the cost at one of the mines he referred to in that paper—Camborne Vean—where the agent had gone into the question of the expense of winding for five hours in one day. The estimate of the cost of drawing 24 tons of tinstuff 260 fms. (including expense of coal, engineman, lander, grease, oil, hemp, and wear and tear of materials, allowing the rope to last 18 months) was 14*s.* 6½d., giving the cost of 7½d. a ton. This was a distance of 260 or 265 fms. Mr. Hocking, in his paper, had given them the statistics of two mines. Capt. Tonkin added some information—the cost of 1*s.* a ton being very low for the great depth, and the means of drawing—but none of the members knew the exact means by which this winding was effected, nor how the estimates were arrived at; nor could they compare the figures with some already in their possession, so that further details were desirable, and all would feel obliged to Capt. Tonkin if, at some future time, he would lay before them data of cost and method of winding. The great object of the Association was to lay before the members correct information as to mining matters. The subject of winding was one of vital importance to the mining of this country, and anything they could do to improve the system, or show that the system needed no improvement, would advance also the association. The point alluded to by Mr. Loam—winding by a wire-rope and a large drum is introducing a defective mechanical principle—is one that must be gone into with some care. He hoped some of the members would look into the question, and be prepared to refute Mr. Loam (if that were possible) at the next meeting.

MR. LOAM observed that the question divided itself into two parts, the engineering and the commercial. If they mixed up the two they would never arrive at a correct conclusion. The old-fashioned plan of testing accurately was to take the dynamometer to ascertain the exact quantity of coal consumed, and thus arrive at the duty. If one engine burnt twice as much coal as another, twice as much steam was generated, so that with the fire was going on a double rate the engine and boilers were worn out in half the time they ought to be. Mr. Grylls had not answered any remark of his. He (Mr. Loam) stated it was not so much the intrinsic weight as the large or small barrel, and that the resistance is increased according to the size of the drum. Presuming the wire-rope to weigh one-third of the hempen one, or 13 cwts. to 200 fms., and the skip and stuff to be 26 cwts. more, over a 12-ft. drum, there would be a strain of upwards of 24 tons to the engine, while a hempen rope, weighing 2 tons, and the stuff and skip 26 cwts. more, would, over a 2½-ft. drum, would require a starting strain of 6 tons and upwards.

Capt. TONKIN said, if the only object were to save expense he had no doubt of the correctness of Mr. Loam's principle, that it would require an engine of greater power to draw 1 ton of stuff 260 fms. by a cage 12 ft. diameter than by one of 3 ft.; no question at all about that. An engine with proper power would wind 40 kibbies, but cost more per ton. The mine to which he referred was Dolcoath, where they had wound 250 fms. at 1*s.* per ton; and at the next quarterly meeting he would have that exact data copied from the cost-book, and examined by their manager. The estimate had been given of 7½d. a ton for a few hours. He had no doubt that estimate was correct for that time, but longer periods must be taken (say, six months), or the would never arrive at correct conclusions. Mr. Loam must know that not only the use of winding machinery but of pumping-engines used to be noted, and it was a reproach on the part of our mining agents and engineers to allow that duty to go back. If they wished to wind a great quantity of stuff they would not do it so economically as only a small or limited quantity. With four horses they would wind up a pump of a ton, or 15 cwts. from the 226, on a compensating wheel, with flat ropes, self-adjusting. If of 12 ft. diameter they would do it in less time, but the expense would be more.

MR. LOAM: We have drawn with flat ropes at the rate of 10 miles an hour.

MR. GRYLLS: If you have only a small barrel four horses will do the work and draw the load up, but if you put the same rope over a large barrel you must have a greater number of horses, and consequently get an increased charge. That is like an argument, but in answer to that let me say that a larger number of horses would be there a shorter time, and it would cost about as much to keep four horses two hours as eight horses one hour. It is merely a question of time and power.

MR. LOAM: With the small drum the small number of horses would be required longer if the drum were of an uniform diameter; but with the flat rope which winds upon itself and becomes a self-acting compensating cage, the speed becomes accelerated as the rope is reduced. To commence with 2½ ft. diameter, and end with 250 fms. deep, with 20 ft. diameter, would give an average diameter equal to a uniform one of upwards 11 ft., with the reduced resistance at starting if upon a small drum. The compensating cage or drum shown here to-day is an imitation of our flat rope one, but not so simple nor self-adjusting.

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LONDON: Printed by RICHARD MIDDLETON, and published by HENRY ENGLISH, (proprietors), at their office, 26, FLEET-STREET, where all communications are requested to be addressed. [May 17, 1862.